TABLE OF CONTENTS

Trouble-shooting instructions : POR-5000

BOSCH system : Motronic

Make of vehicle : PORSCHE

Basic microcard : POR-507

Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

This microcard contains the testing and repair instructions for the Motronic in the

- Porsche 924 S as of 9.85 for application worldwide excluding USA, as of 3.86 for USA
- Porsche 944 as of 9.85 with low-compression engine for application worldwide.

The engine type in the 924 S model is identical to the engine type in the 944 with lambda closed-loop control. The low-compression engine (9.7: 1) can be run with and without catalytic converter, i.e. with unleaded regular gasoline.
Installed as standard are a closed fuel-tank ventilation system, idle-charge control and a common Motronic contol unit for operation with and without lambda closed-loop control.
The central electrics in the 924 S correspond to the status in the Type 944 up to 1.85.

Variant coding for control unit 0261 200 077
In order to be able to use one common control unit for all variants for different countries and vehicles with and without catalytic converter, terminal 10 and terminal 30 are connected in different ways in the wiring harness. For this purpose, Porsche offers a coding plug (short-circuitng link) and an adapter plug with 1.8 k Ω resistance.
Porsche part number for

Coding plug	944.612.525.00
Adapter plug (1.8 k Ω)	944.612.421.00

The ignition and injection maps are altered using these plugs.
The relevant connectors are positioned at the Motronic wiring harness, near to the control unit.
The long cable leads to term. 30 of the control unit and to ground; the short cable leads to term. 10 of the control unit and to ground. The altitude sensor is connected instead of the adapter plug (with 1.8 k Ω) to term. 30 (long cable).

SPECIAL FEATURES (CONTINUED)

2.5 l engine, low-compression	Encoding plug at term. 10	A=Altitude sensor at term. 30 B=Adapter plug (1.8 k Ω) at term. 30 C=Term. 30 open
ROW vehicles without cat.	no	B
Vehicles with cat. (except California)	no	A(only USA) or C
Switzerland, Sweden, and Germany (level A*) without catalytic converter	yes	B
California with cat.	yes	A

ROW = Rest of world
Cat.= Catalytic converter
* Per FRG-specific emissions regulations

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart makes it possible for the experienced Motronic specialist to rapidly test the electrical part of the system using the universal test adapter.

The rapid diagnosis chart contains the following information:

* Test-step sequence.
* Position of the V- and Ω -program switch.
* Remarks on operating the universal test adapter or other components.
* Test specifications for motortester and multimeter.

Note:
* Adapter cable 1 684 463 124 for vehicles without lambda closed-loop control.
* Adapter cable 1 684 463 128 for vehicles with lambda closed-loop control.

Adapter cable 1 684 463 124 can also be used for vehicles with lambda closed-loop control by way of replacement; however, the lambda test steps must be carried out in addition (see test steps 43a, 44a, and 45a).

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

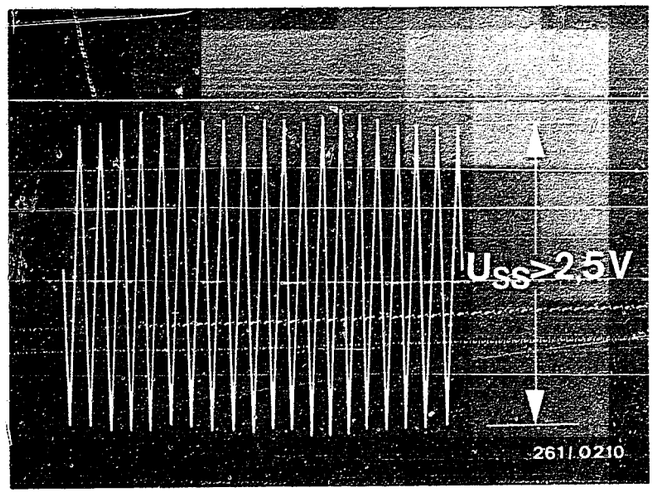
Applies to control units 0 261 200 077

Test step	Switch position V	Switch position Ω	Measurement	Measurement at control-unit plug between terms.	Remarks	Test specifications (reading)
1	V	1	Insulation resistance of engine-speed sensor.	8 and 5	Disengage gear. Ignition on. Disconnect control unit and pump fuse no. 2.	greater than 1 M Ω
2	V	2	Insulation resistance of reference-mark sensor.	25 and 5	—	greater than 1 k Ω
3	V	3	Winding resistance of engine-speed sensor.	8 and 27	—	0,6...1,6 k Ω
4	V	4	Winding resistance of reference-mark sensor.	25 and 26	—	0,6...1,6 k Ω
5	V	5	Resistance of temperature sensor, engine (NTC II).	13 and 5	Resistance temperature-dependent: (+ 15° C...+ 30° C) : (+ 80° C) :	 1,45...3,3 k Ω 280...360 Ω
6	V	6	Resistance of temperature sensor, air (NTC I).	22 and 5	Resistance temperature-dependent: (+ 15° C...+ 30° C) : (+ 80° C) :	 1,45...3,3 k Ω 280...360 Ω
7	V	7	Resistance of characteristic-map switch	10 and 5	For Sweden/Switz. and level A*, as well as California : For US federal and general:	less than 10 Ω greater than 1 M Ω
8	V	8	Not applicable	—	—	—
9	V	9	Throttle-valve switch: Resistance of idle contact.	2 and 5	Acceleratior pedal at rest : Throttle valve slightly open:	less than 10 Ω greater than 1 M Ω
10	V	10	Throttle-valve switch: Resistance of full-load contact.	3 and 5	Fully depress accelerator pedal:	less than 10 Ω

*Per FRG-specific emissions regulations

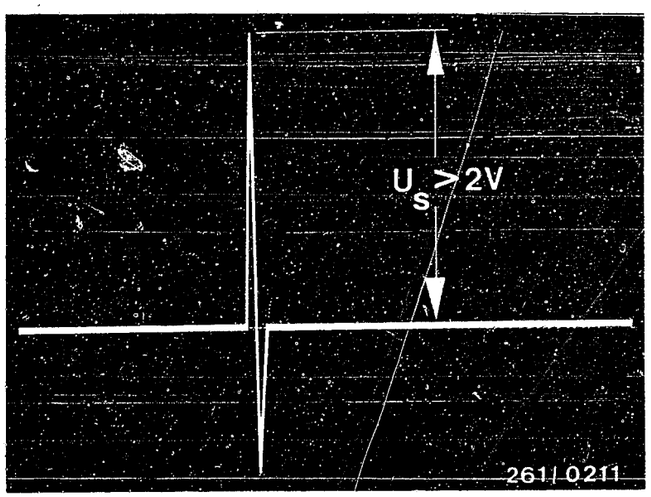
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Test step	Switch position V	Switch position Ω	Measurement and remarks	Measurement at control-unit plug between terms.	Test specifications (reading)
11	V	11	Resistance of ground lead	16 and 5	less than 10 Ω
12	V	12	Resistance of ground lead	17 and 5	less than 10 Ω
13	V	13	Resistance of ground lead	19 and 5	less than 10 Ω
14	V	14	Resistance at input for altitude correction. Vehicles without lambda closed-loop control: Vehicles with lambda closed-loop control: Vehicles with altitude sensor, switch open (below 1000 m): Vehicles with altitude sensor, switch closed (above 1000 m):	30 and 5	 1,6...2 k Ω greater than 1 M Ω greater than 1 M Ω less than 10 Ω
15	V	15	Resistance of driving-position selector switch.	28 and 5	less than 10 Ω
16	1	15	Engine-speed-sensor signal using oscilloscope. Disengage gear and start.	8 and 27	See upper illustration
17	2	15	Reference-mark-sensor signal using oscilloscope. Disengage gear and start.	25 and 26	See lower illustration



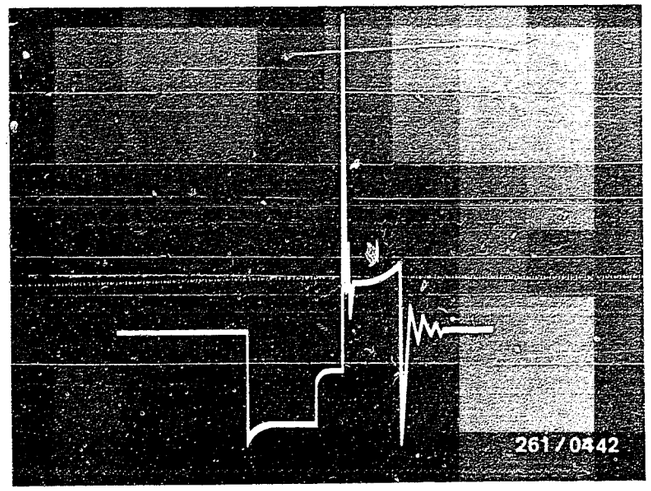
Engine-speed sensor signal

Reference-mark sensor signal



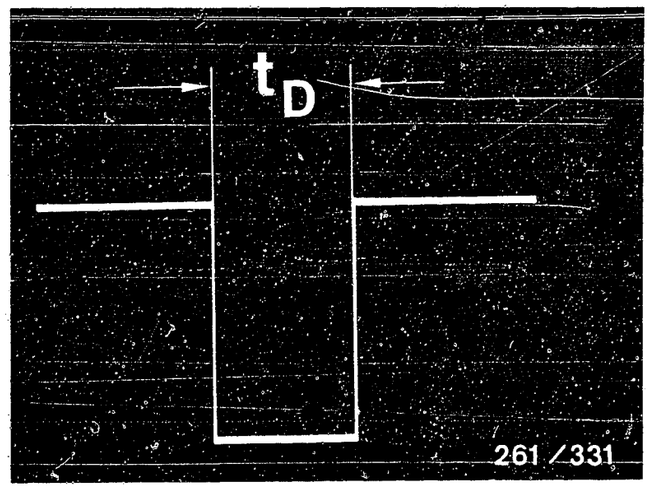
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (Continued)

Test step	Switch position V	Switch position Ω	Measurement and remarks	Measurement at control-unit plug between terms.	Test specifications (reading)
18	3	15	Not applicable	10 and 5	——
19	4	15	Voltage of air-conditioning system (if present). Switch on air conditioner.	29 and 5	greater than 8 V
20	6	15	Voltage of main relay. Ignition on.	35 and 5	10...15 V
21	7	15	Voltage of main relay. Ignition on.	18 and 5	10...15 V
22	5	15	Ignition signal from ignition coil using oscilloscope. Ignition off. Connect control unit. Disengage gear and start.	1 and 5	Signal present (see upper illustration)
23	8	15	Supply voltage for air-flow sensor. Ignition on.	9 and 5	greater than 4,5 V
24	9	15	Wiper voltage of potentiometer in air-flow sensor. Ignition on.	7 and 5	Sensor flap at rest: 200...300 mV Sensor flap fully opened: greater than 4,2 V
25			Not applicable		
26	11	15	Not applicable		
27	12	15	Starting signal from term. 50. Disengage gear and start.	4 and 5	8...15 V
28	13	15	Dwell-period signal, using oscilloscope. Disengage gear and start.	21 and 5	See lower illustration.



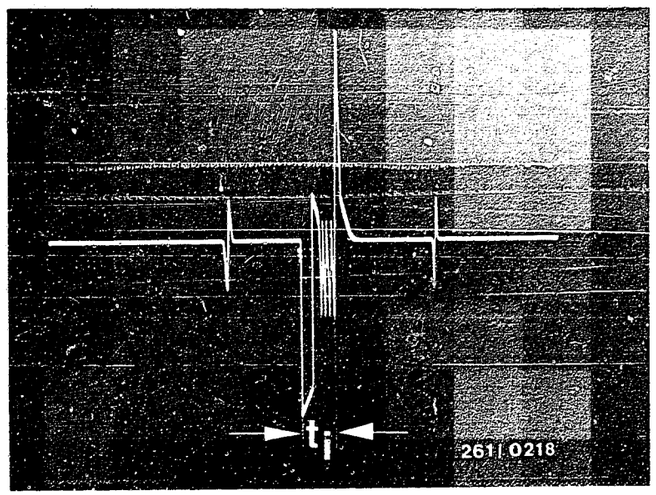
Ignition signal

t_D = Dwell period

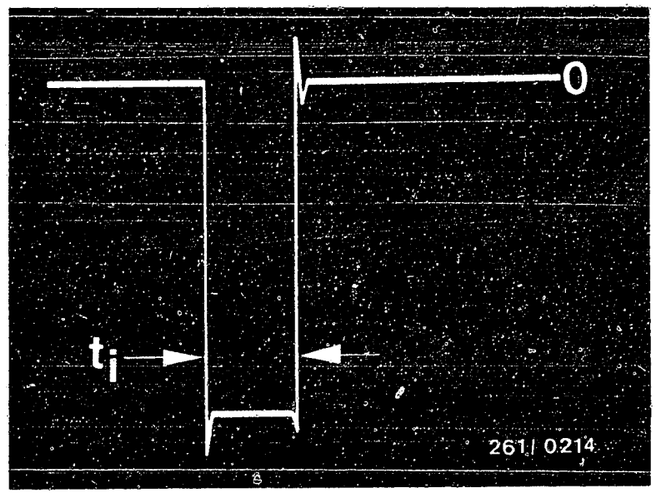


RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (continued)

Test step	Switch position V	Switch position Ω	Button	Measurement and remarks	Measurement at control-unit plug between terms.	Test specifications (reading)
29	14	15	–	Injection signal from control unit, using oscilloscope. Disengage gear and start.	14 and 5	See upper illustration
30	14	15	T1	As 29, except after pressing button (NTC II, cold) injection duration is increased somewhat. Press button only about 2 seconds.	14 and 5	See upper illustration; t_i becomes slightly wider
31	15	15	–	As test step 29, except 2nd output for fuel-injection valves	15 and 5	See upper illustration
32	16	15	–	Injection signal from control unit, using oscilloscope. Disengage gear and start.	11 and 5	See lower illustration
33	17	15	–	Voltage at pump relay. Plug in pump fuse. Ignition on.	20 and 5	10...15 V
34	17	15	–	Voltage at pump relay. Test of pump actuation in control unit. Disengage gear and start.	20 and 5	max.4V
35	17	15	T3	Fuel-pressure test: Ignition off. Connect pressure gauge to test connection. Ignition on. Press button T3.	20 to ground	2,3...2,7bar

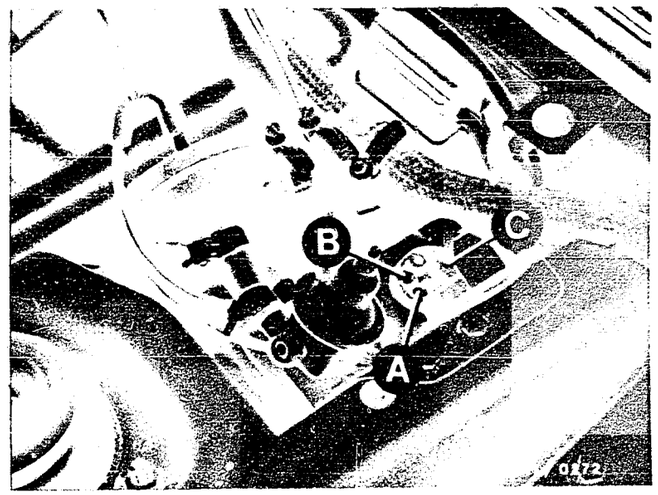


t_i = Duration of injection



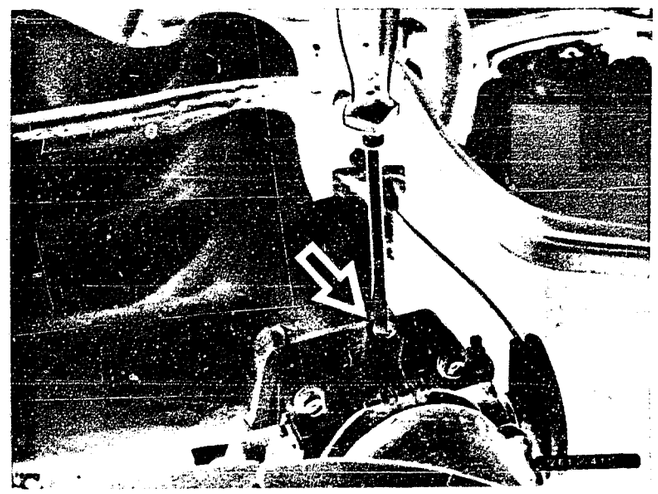
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Test step	Switch position V	Switch position Ω	Button	Measurement and remarks	Measurement at control-unit plug between terms	Test specifications (reading)
36	17	15	–	Test CO and idle speed: Connect motortester and diagnostic cable (1 684 463 095 or ..158). On vehicles with lambda closed-loop control, connect CO tester to test connection before catalytic converter (in engine compartment on right). When testing with adapter cable 1 684 463 124, separate lambda-sensor plug connection. Carry out CO measurement first. Engine temperature approx. 90°C, intake-air temperature approx. 15...30°C, consuming devices switched off. Make adjustments quickly.	———	without lambda closed-loop control 0,5...1,5 vol. % CO. with lambda closed-loop control 0,4...0,8 vol. % CO.
			T5 and T6	For testing and adjusting idle speed, connect term. B and term. C at test socket with cable, or press buttons T5 and T6 simultaneously, and read off test value. Remove cable at test base or release buttons, give a snap acceleration at the accelerator pedal, and check idle speed.		800...860 min^{-1}



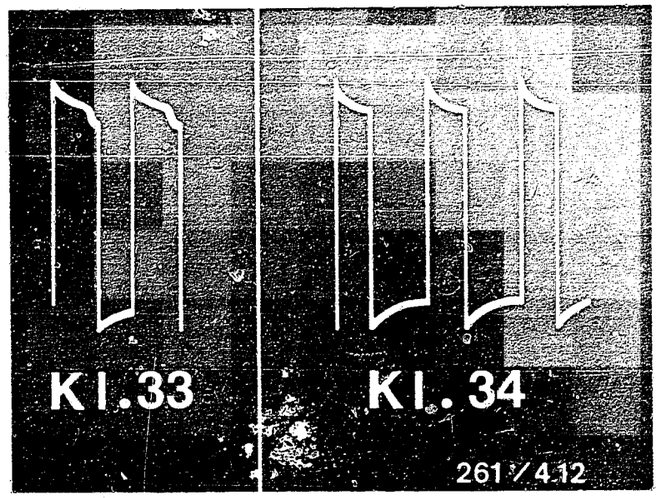
A, B, C = Terminals of test socket

Arrow = Adjusting screw for idle speed



RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Test step	Switch position V	Switch position Ω	Button On	Measurement and remarks	Measurement at control-unit plug between term.	Test specs. (reading)
37	17	15	–	Test spark advance at idle speed: run engine (at normal operating temperature) at idle speed (800...880 min $^{-1}$) Set speed precisely, otherwise	—	Term.30 to 1,8 k Ω 5°...15° Term.30 open
				incorrect spark advance is indicated.		or to ground: 0°...10°
38	17	15	T6	Test spark advance at full load: Engine at normal operating temperature. Set engine to 3000 min $^{-1}$. Press button T6.	3 to ground	17°...27° at 3000min $^{-1}$
39	17	15	–	Dwell angle at idle speed	—	10°...16°
				Dwell angle at 2000 min $^{-1}$	—	18°...28°
40	17	15	T5	Test overrun cut-off: Keep speed 3000 min $^{-1}$ constant. Press button T5. Injection signals interrupted and speed fluctuates rhythmically.	2 to ground	Engine hunts
41	18	15	–	Signal at idle actuator. Run engine at idle speed.	33 and 5	See upper illustration
42	19	15	–	Signal at idle actuator. Run engine at idle speed.	34 and 5	See upper illustration



Signals at idle actuator

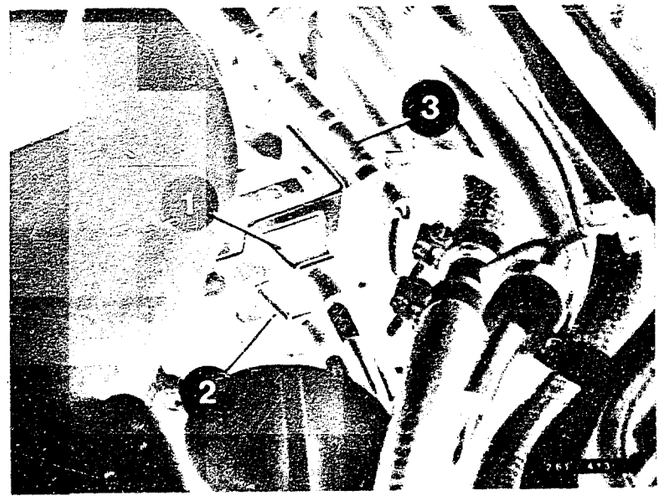
The following test steps apply only for vehicles with lambda closed-loop control. Testing of the lambda closed-loop control may be performed as follows:

1. Using adapter lead 1 684 463 128, see test steps 43, 44, 45.
2. Without test adapter, if only the adapter lead 1 684 463 124 is available for testing the Motronic, see test steps 43a, 44a, 45a.

For both test methods, connect the CO analyzer in front of the catalytic converter and run engine (at normal operating temperature) at idle.

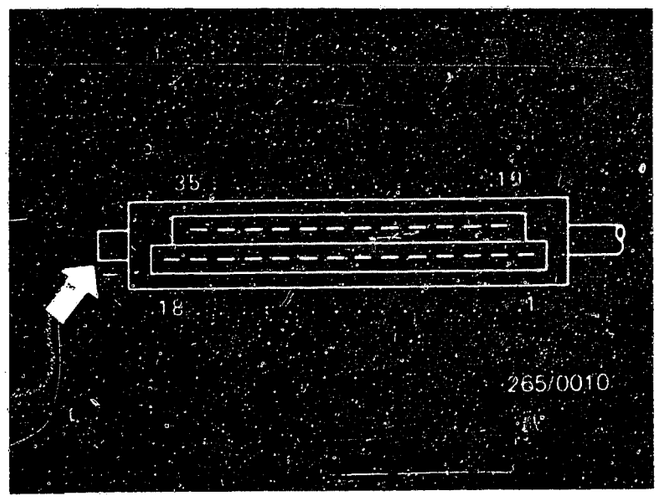
Test step	Switch position V	Switch position Ω	Measurement and remarks	Control-unit plug term.	Test specifications (reading)
43	20	22	Test using adapter lead 1 684 463 128: upper limit of lambda closed-loop control under test. Test adapter applies term. 24 of control unit to ground. Perform this test only briefly to protect the catalytic converter.	24 to ground	CO rises above 1,5 % CO by vol.
44	20	23	As Test step 43, however, lower limit of lambda closed-loop control. Test adapter applies + 2V to term. 24 of control unit.	24 to +2V	CO falls below 0,4 % CO by vol. Rough idling
45	20	24	Lambda sensor in closed-loop control mode under test. Test adapter connects term. 24 of control unit to lambda sensor.	24	0,4...0,8 % CO by vol.
			As above, however, disconnect air hose at pressure regulator and seal. Observe CO value immediately.		CO value rises briefly and falls back to closed-loop control value above.

Test step	Measurement and remarks	Test spec. (reading)
Testing of lambda closed-loop control without test adapter		
43a	The upper limit of lambda closed-loop control is tested. Separate the lambda-sensor plug connection and connect the lead to the control unit (term.24) to ground. Carry out this test step only briefly, to prevent damage to the catalytic converter.	CO rises above 1,5 vol.%
44a	The lower limit of lambda closed-loop control is tested. Connect the disconnected lead to the control unit (term.24) to approx. + 2 V (e.g. 1.5 V single-cell battery, positive to term.24, negative to vehicle ground).	CO falls below 0,4 vol.%, uneven engine running
45a	The lambda sensor is tested in closed-loop operation. Reconnect the lambda-sensor plug connection.	0,4...0,8 vol.% CO
	As above, except pull off air hose at pressure regulator and seal. Immediately observe CO value.	CO value briefly rises and falls back to above control value.



1 = Plug connection for speed sensor
2 = Plug connection for reference-mark sensor
3 = Plug connection for lambda sensor

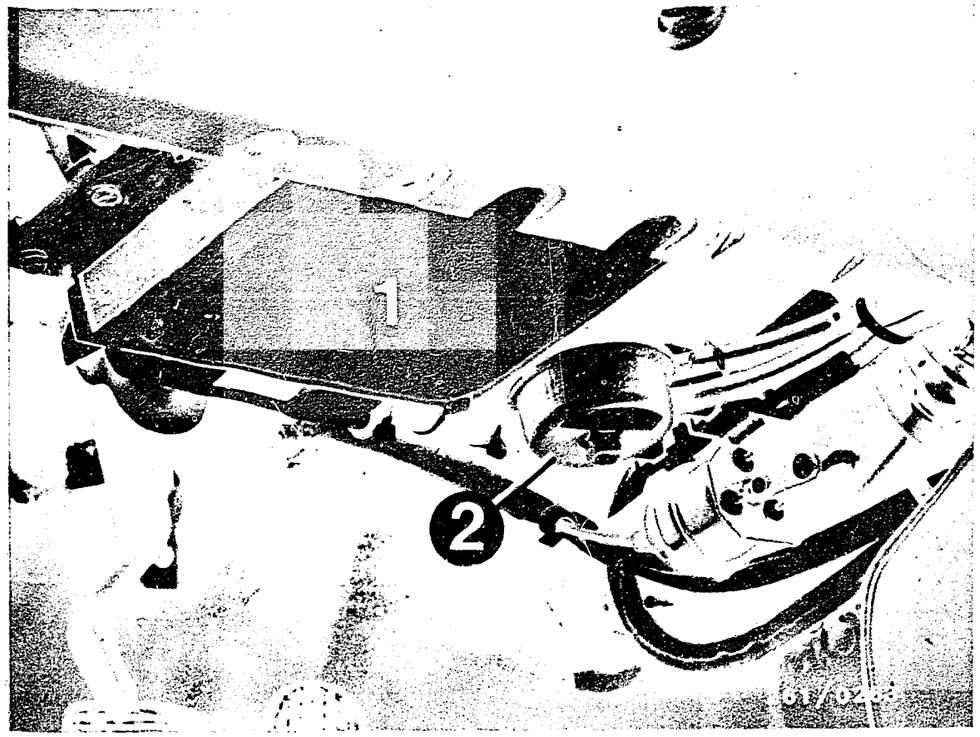
Top view of control-unit plug (35-pin) with terminal numbers.
Arrow = Lug with mechanical coding



Pressure regulator	
Fuel pressure	2,3...2,7 bar
Electric fuel pump	
Fuel delivery (measured in return)	at least 850 cm ^{3} /30s
Supply voltage (under load):	at least 12 V
NTC temperature sensor I (Air)	
Internal electrical resistance measured at air-flow sensor between term.22(1) and term. 6(4) at ambient temperature (+15°C...+30°C):	1450...3300 k Ω
NTC temperature sensor II (Engine)	
Plug color, blue. Internal electrical resistance at ambient temperature (+ 15° C...+ 30° C):	1450...3300 k Ω
with engine at norm. op. temp. (approx. + 80° C):	280... 360 Ω
Solenoid-operated injection valve	
Internal electrical resistance at ambient temperature (+ 15° C...+ 30° C):	2... 3 Ω
Air-flow sensor	
Internal electrical resistance between:	
Term.7 (2) and term.6 (4):	8...1000 Ω (*)
Term.9 (3) and term.6 (4):	500... 800 Ω
(*) Deflect air-flow sensor flap as far as will go.	

Engine-speed sensor and reference-mark sensor, electrical internal resistance at ambient temperature (+15°C...+30°C):	600...1600 Ω
Throttle-valve switch	
Resistance of idle-speed contact (term.1 and term.2):	0 Ω
Resistance of full-load contact (term.3 and term.2)	0 Ω
Altitude sensor	
above altitude of 1000 m, contact is closed:	0 Ω
Below altitude of 1000 m, contact is open:	infinite Ω
Idle actuator, electrical internal resistance at +15°...+30°C between	
term.4 and term.5:	17...19,5 Ω
term.4 and term.3:	19...21,5 Ω
Lambda sensor, resistance of heating winding	6...20 Ω
Idle adjustment	
Engine at operating temperature, ambient temperature +15°...+30°C. Switch off consuming devices. Idle speed: (bridge at test socket terms.B and C)	800...880 min $^{-1}$
CO concentration: Without catalytic converter:	0,5...1,5 vol.% CO
Vehicles with catalytic converter: (measure CO before catalytic converter, separate lambda-sensor plug)	0,4...0,8 vol.% CO

For setting values for valve clearance and other technical engine data, see equipment and Autodata microcard.



924 S: 1 = Control unit
2 = Altitude sensor

INSTALLATION POSITION OF COMPONENTS

Information is always with reference to the direction of vehicle travel.

Control unit:
924 S: Behind dashboard covering in front of steering column
944 : On passenger side, behind footwell covering

Altitude sensor and adapter plug with 1.8 k Ω for 924S and 944 : next to control unit

Motronic relay (main and pump relay):
924 S: On central electrics console, DME relay (U), to the left of the steering column.
944 : In central electrics console, DME relay (G5), in engine compartment on left.

Reference-mark and engine-speed sensor:

On crankcase flange below oil filler inlet.

Temperature sensor I (air):

In air-flow sensor.

Temperature sensor II (engine):

On left side of engine, between cyls. 1 and 2 (blue plug).

Ground terminals:

On clutch housing and on engine block, near engine-speed and reference-mark sensor.

Idle actuator:

Below intake distributor

Lambda sensor:

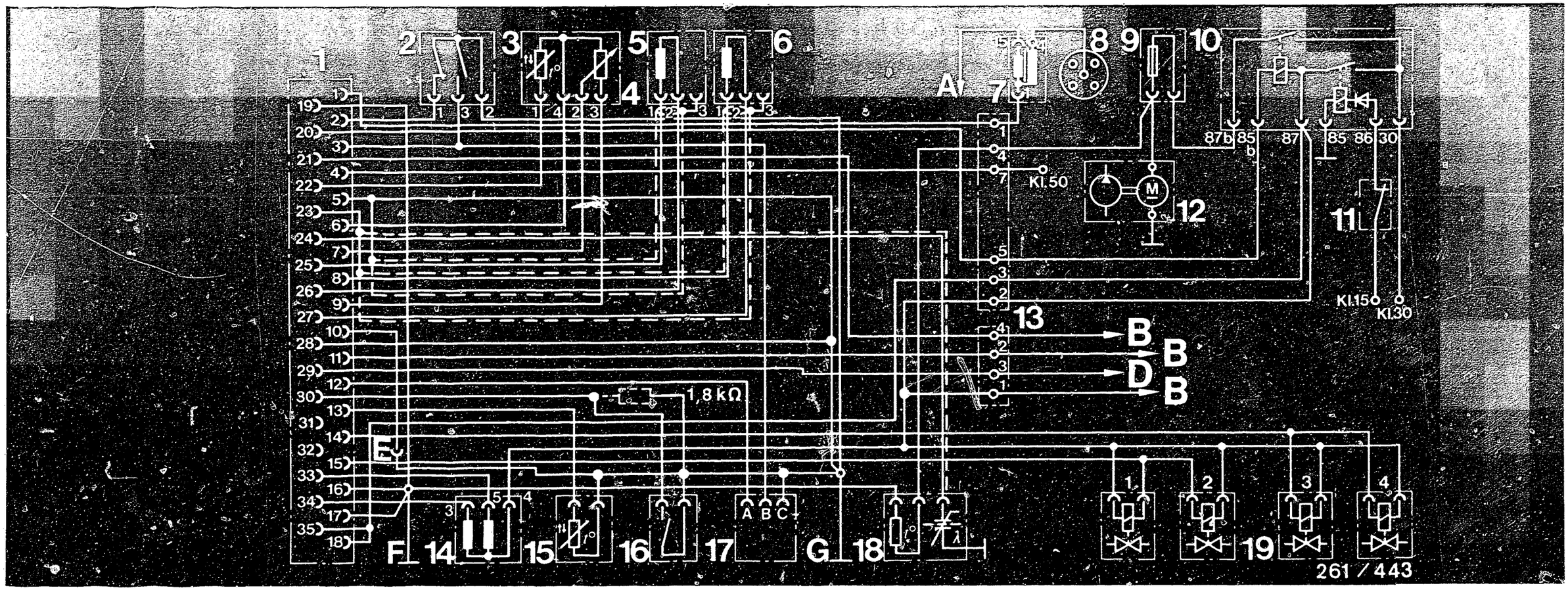
In common exhaust pipe before catalytic converter.

Temperature switch + 58° C:

Below intake manifold on 4th cylinder.

Throttle-valve switch:

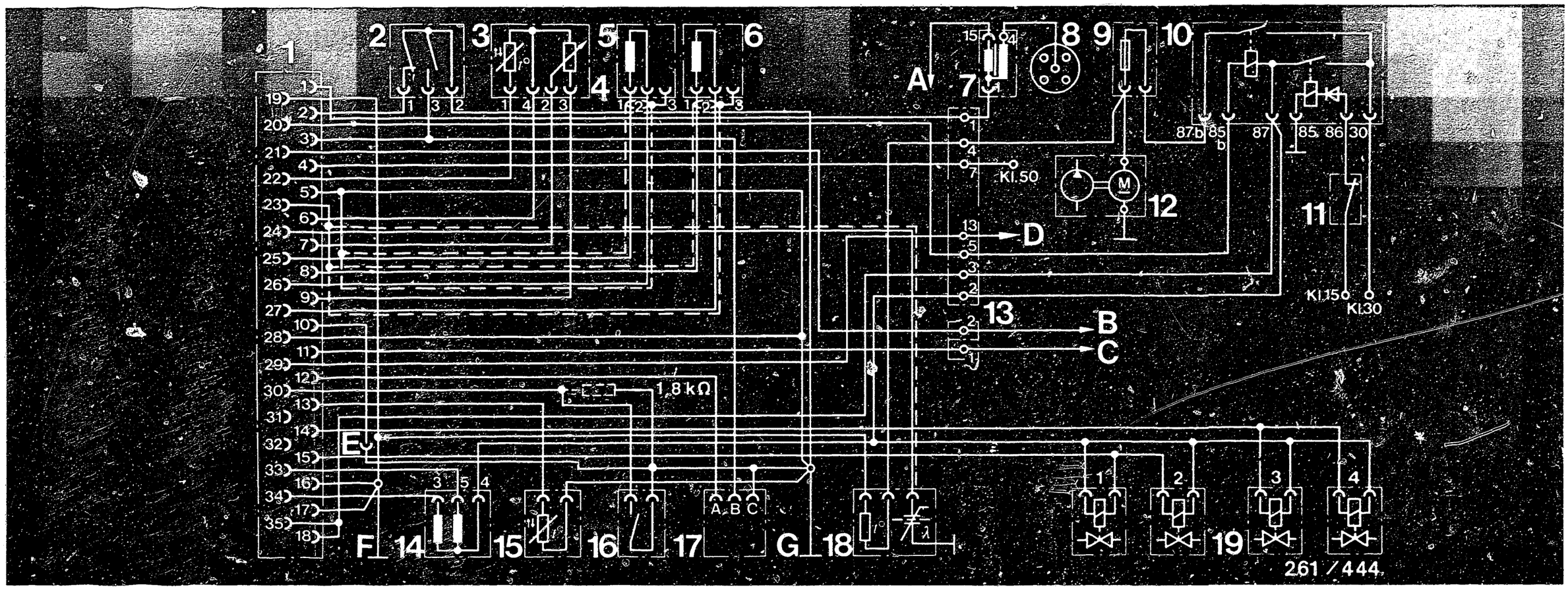
On throttle-valve assembly.



1 = Motronic control-unit plug
2 = Throttle-valve switch
3 = NTC temperature sensor I (air)
4 = Air-flow sensor
5 = Reference-mark sensor
6 = Engine-speed sensor
7 = Ignition coil
8 = High-voltage distributor
9 = Fuse no. 2 in auxiliary fuse box
10 = Pump and main relay (DME relay U in central electrics console)
11 = Alarm system (if present)
12 = Fuel pump
13 = Plug connection in engine compartment
14 = Idle actuator
15 = NTC temperature sensor II (engine)
16 = without cat. converter: Adapter plug connected with 1.8 k Ω .
with cat. converter: Altitude sensor for US (as illustrated) or term. 30 open
17 = Test socket
18 = Lambda sensor (heated) or dummy plug for vehicles equipped for catalytic converter
19 = Fuel-injection valves (cyls. 1, 2, 3, 4)

A = To central electrics console A12 (term.15)
B = To tachometer
D = To air conditioner (B+)
E = Characteristic-map plug: general: open
California and CH/S, and D, level A: plugged
F = Ground, clutch housing
G = Ground, engine block

ELECTRICAL TERMINAL DIAGRAM FOR PORSCHE 924 S as of 9.85



1 = Motronic control-unit plug
2 = Throttle-valve switch
3 = NTC temperature sensor I (air)
4 = Air-flow sensor
5 = Reference-mark sensor
6 = Engine-speed sensor
7 = Ignition coil
8 = High-voltage distributor
9 = Fuse no. 34 in central electrics console
10 = Pump and main relay (G5 in central electrics console
11 = Alarm system
12 = Fuel pump
13 = Plug connection in engine compartment
14 = Idle actuator
15 = NTC temperature sensor II (engine)
16 = without cat. converter: Adapter plug connected with 1.8 k Ω .
with cat. converter: Altitude sensor for US (as illustrated) or term. 30 open.
17 = Test socket
18 = Lambda sensor (heated) or dummy plug for vehicles equipped for catalytic converter
19 = Fuel-injection valves (cyls. 1, 2, 3, 4)

A = To central electrics console C32 (term. 15)
B = To tachometer
C = To consumption indicator
D = To air conditioner (B+)
E = Characteristic-map plug: general: open
California and CH/S, and D, level A: plugged
F = Ground, clutch housing
G = Ground, engine block

ELECTRICAL TERMINAL DIAGRAM FOR PORSCHE 944 (LOW-COMPRESSION ENGINE) as of 9.85

TABLE OF CONTENTS

Trouble-shooting instructions : MB-5000

BOSCH system : KE 3.1 - Jetronic

Make of vehicle : Mercedes-Benz

Basic microcard : MB-525

Note:
Items without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* This microcard contains the trouble-shooting instructions, valid at the time of publication, for the following Mercedes-Benz model:

  190E, 2,01/4-Zyl.-Mot. (J,AUS) 08.85->

* Trouble-shooting with these instructions may only then take place when the details of the "Summary - Service Information for Vehicles" (KFZ-000) coincide with those of the vehicle type and with the BOSCH number of the KE-Jetronic control unit installed.

* Control unit using digital techniques, characteristic-map control using microprocessor.

* Electronically controlled low-idle-speed control with single-winding rotary actuator, without bypass adjusting screw.

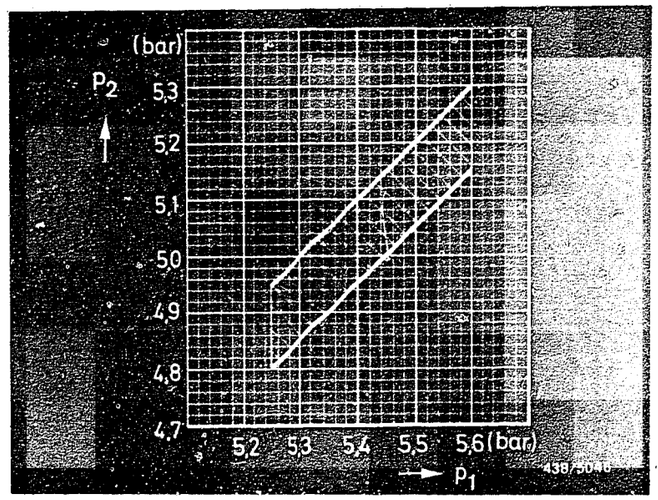
* Activated-carbon filter and regeneration valve for return of gasoline vapors into the intake manifold. (Fuel evaporation system)

Important note:

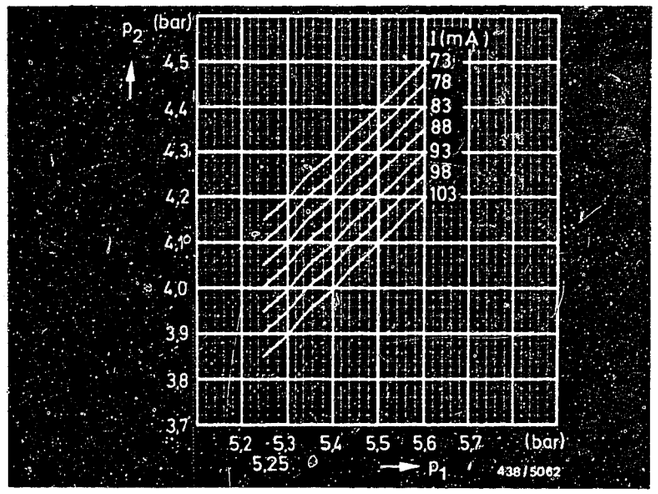
If reference is made to a basic microcard, always make sure you use the test specifications from the vehicle-specific brief instructions.

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	at least 1000 cm^3 /min	
2	Primary pressure:	5,25...5,6 bar	
3	Differential pressure: Suppression of peak coil current: actuate starting motor with fuel-pump relay disconnected. Do <u>not</u> switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0.15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 2,7 bar 2,6 bar	
5	Injection valves, opening pressure:	3,0...4,1 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA)	Setting point: (cm^3 /min)	Max. permis. delivery: (cm^3 /min)
	Idle: Part load: Full load:	6,0 40,0 100,0	6,6 42,5 109,0
	Min. delivery at max. air-flow sensor plate defl.:	140 cm^3 /min	



p_1 = Primary pressure
p_2 = Lower-chamber pressure



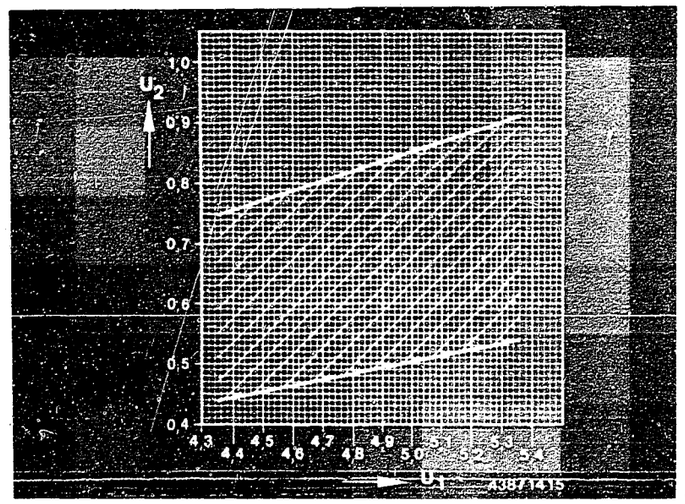
B03 — ⟹ | B04 — ⟺

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
7	Rate of flow, KE restriction:	130...150 cm^3 /min
8	Temperature sensor, air (NTC I): Air temperature +15...+30°C:	 —— k Ω
9	Temperature sensor, engine (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting: Fuel-distributor seat - needle bearing:	 20,9...21,6 mm
11	Idle adjustment: Low-idle-speed control: adjustment of idle-air delivery not possible. For testing, engine at norm. op. temp. Idle speed: Engage driving position, speed: Engage driving position and switch on air conditioner, speed: Check lambda closed-loop control: Measurement with lambda closed-loop control tester (e.g. KDJE-P 600) and adapter lead (e.g. KDJE-P 600/52) at diagn. socket outlet (pin3) Alternatively: Current measurement using universal test adapter. Put fuel evaporation system out of operation. On/off ratio fluctuating, mean value: Adjustment at idle-mixture-adjusting screw.	 720...820 min^{-1} 620...720 min^{-1} > 720 min^{-1} 40...60 %

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
12	Signal, air-flow sensor potentiometer: (Checking necessary when poor idle and/or part-load behavior) Measurement using test adapter and voltmeter. Determine supply voltage of potentiometer: Set value (test adapter, V-position 10): Determine potentiometer signal at idle speed. (Test adapter, V-position 11) Set value corresponding to supply voltage: Adjust signal if necessary at trimming potentiometer (at right next to potentiometer pins). Afterwards, re-secure adjusting screw of trimming potentiometer using black sealing compound (e.g Teroson).	 4,35...5,35 V See chart



U_1 = Supply voltage potentiometer

U_2 = Potentiometer voltage signal

p1 = Primary pressure

p2 = Lower-chamber pressure

SELF-DIAGNOSIS

All Daimler-Benz 4- and 6-cylinder engines in the current series (approx. 10.85) are equipped with self-diagnosis using on-off ratio measurement.

Incorrect input signals from the KE-Jetronic control unit can be displayed with the lambda closed-loop tester at the lambda test output (diagnosis socket, socket 3).

This provides information on short and open circuits. Defects which occur sporadically (e.g. loose contacts) are not indicated. Output of fault signals has priority over output of the lambda closed-loop signal.

We will not go into the defects which can be indicated in more detail here, since the input signals of the KE-Jetronic control unit can be tested with the universal test adapter (rapid-diagnosis chart).

However, if when testing the lambda closed-loop control by means of on-off ratio measurement, a constant on-off ratio is indicated, then the input signals of the KE-Jetronic control unit should be tested (rapid diagnosis chart).

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 WITH KE3 ADAPTER LEAD 1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the the KE-Jetronic, inlcuding the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

A t t e n t i o n :

When carrying out the test, make sure that the trimming plug is in position 1.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	V	4	–	Internal resistance (R_i) press. actu.	12–10	Disconnect control-unit plug.	20...30 Ω
2	V	5	–	Resistance NTC II (engine)	21– 2	Engine temperature +15...+30°C: approx. +80°C:	1,3...3,6 k Ω 250...390 Ω
3				Resistance NTC I (intake air)		Air temperature in area of NTC I = +15...+30°C:	Test step not applicable
4	V	6	–	Signal, altitude sensor	11– 2	Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	 3,2...4,5 V 2,8...4,0 V 2,4...3,5 V 2,0...3,0 V 1,6...2,5 V 0,8...1,6 V
5	V	9	–	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	 0...10 Ω > 1000 Ω
6	V	10	–	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	infinite Ω 0...10 Ω
7	V	11	–	Microswitch idle linkage	24– 2	Throttle valve closed: open:	0...10 Ω infinite Ω
8	V	12	–	Ground, control unit	20– 2		0...10 Ω
9	V	13	–	Ground, pin 7	7– 2	Switch off ignition. Connect control unit.	0...10 Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
10	| V	14	–	Trimming plug mixture map	22– 2	Disconnect control-unit plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) to engine ground. Trimming-plug position 1: 2: 3: 4: 5: 6: 7:	 0...10 Ω —— Ω —— Ω —— Ω —— Ω —— Ω —— Ω
11	| V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer. Selection lever position P,N: Driving position selected:	 0...10 Ω infinite Ω
12	5	–	–	TD signal	25– 2	Start engine (starting motor):	Voltage undefined
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	8...15 V
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	8...15 V
16	9	–	–	Air-conditioner cut-in signal	19– 2	Switch off ignition. Connect control unit. Start engine, switch on air conditioner. Temperature regulator = minimum temperature	 8...15 V
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,35 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
18	11	–	–	Signal, air-flow sensor potentiometer	17– 2	Switch on ignition. Air-flow sensor plate in neutral position: Defect air-flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V
19	13	–	1	Temperature signal form control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage indefined Voltage change
21	–	–	–	Peak coil current	12–12	Switch on ignition:	–>FD ——: ———— mA FD 548 –>: 90...110 mA
22	–	–	1	Warm-up enrichment + 20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	–>FD ——: ———— mA FD 548 –>: 9... 11 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Engine at norm. op. temp., idle. Current value with btn 2 pressed; reading oscillating, mean value:	–>FD ——: ———— mA FD 548 –>: –1...+1 mA
24	–	21	1	Starting enrichment	12–12	So that engine fails to start: Disconnect speed relay for electric fuel pump. Short circuit ignition coil term. 4 to ground via resistance of at least 2 k Ω . (e.g. with sleeve-type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 sec.) to:	–>FD ——: ———— mA FD 548 –>: 60... 80 mA

*) FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

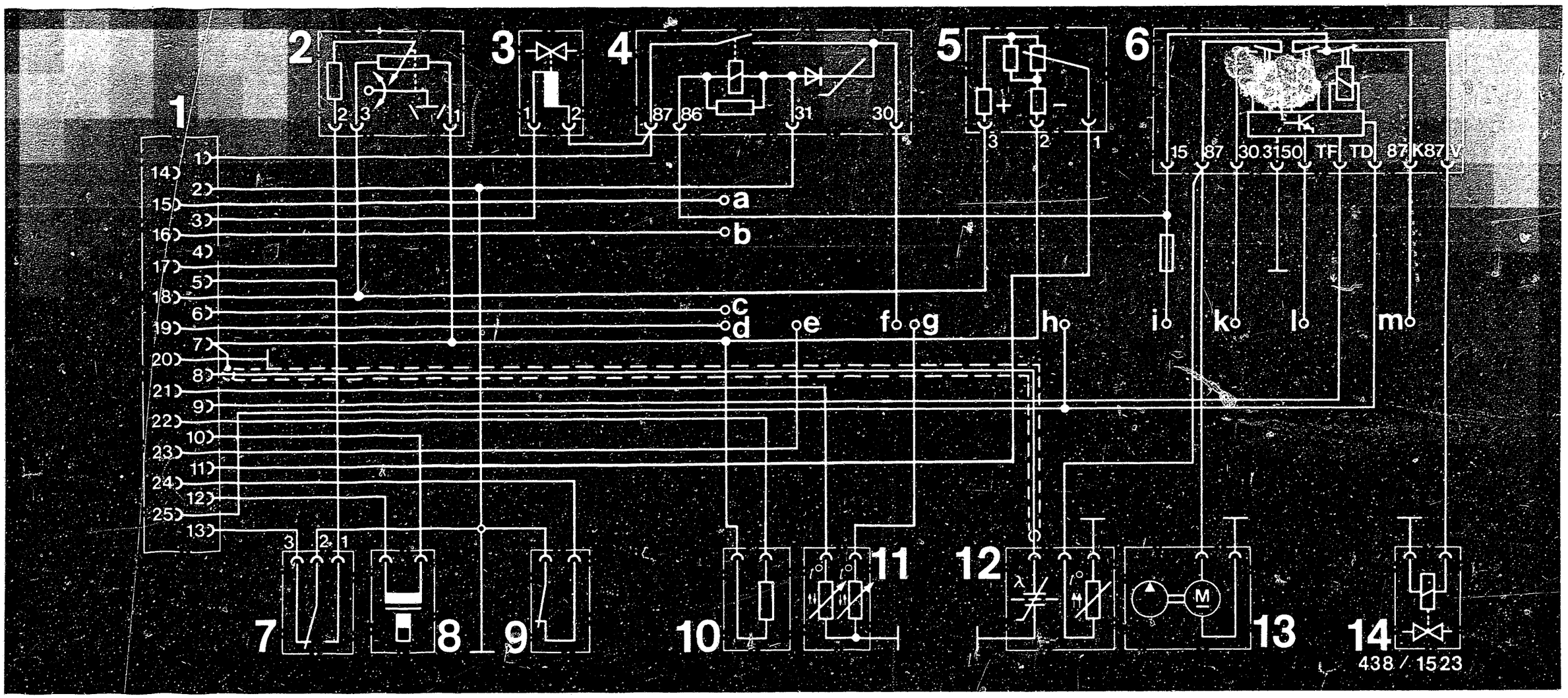
No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
25	–	21	1	Post-start enrichment	12-12	Start engine (at normal operating temperature) while actuating btn 1. Current value: Current value constant for approx: Then slow speed regulation to:	->FD ——: ——— mA FD 548 ->: 19...23 mA ->FD ——: ——— s FD 548 ->: 4... 9 s ->FD ——: ——— mA FD 548 ->: 9...11 mA
26	–	21	1	Acceleration enrichment	12-12	Engine at normal operating temperature, idle. While actuating btn 1, perform snap acceleration of engine. Thus current rise (approx. 1 s) to: Note: Level of current value dependent upon intensity of acceleration (travel/duration of air-flow sensor flap movement).	->FD ——: ——— mA FD 548 ->: 50...80 mA
27	–	–	–	Overrun cut-off	12-12	Re-connect ammeter (swap positive and negative) Start engine (normal operating temperature). Speed n to approx.: Hold there. Manually actuate idle throttle-valve switch (for 4- and 6-cyl. engines, microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:	->FD 551: 3200 min $^{-1}$ FD 552 ->: 1800 min $^{-1}$ -40...-80 mA

*) FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specification CAT
28	–	24	–	Full-load enrichment	12-12	Engine at normal operating temperature, idle. Reading oscillating, mean value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: A t t e n t i o n: Do this very briefly, so that speed does not rise too much and engine is not damaged.	 ->FD ——: ——— mA FD 548 ->: –1...+1 mA ->FD ——: ——— mA FD 548 ->: 3...5 mA
29	–	21	–	Lambda closed-loop control, open-loop control mode	12-12	Disconnect regeneration lead to throttle-valve assembly at generation valve and seal. Engine at norm. op. temp., idle. Current value:	 –1...+1 mA
30	–	24	–	Lambda closed-loop control, closed-loop control mode	12-12	Engine at norm. op. temp., idle. Closed-loop control mode can be recognized from the oscillating current reading. Mean value: If mean value outside tolerance, set (idle-mixture-adjusting screw) to approx.:	 –1...+1 mA 0 mA
31	–	22	–	Lambda closed-loop control, rich stop	12-12	Engine at norm. op. temp., idle. Current rise to:	9... 11 mA
32	–	23	–	Lambda closed-loop control, lean stop	12-12	Engine at norm. op. temp., idle. Current drop to:	–9...–11 mA

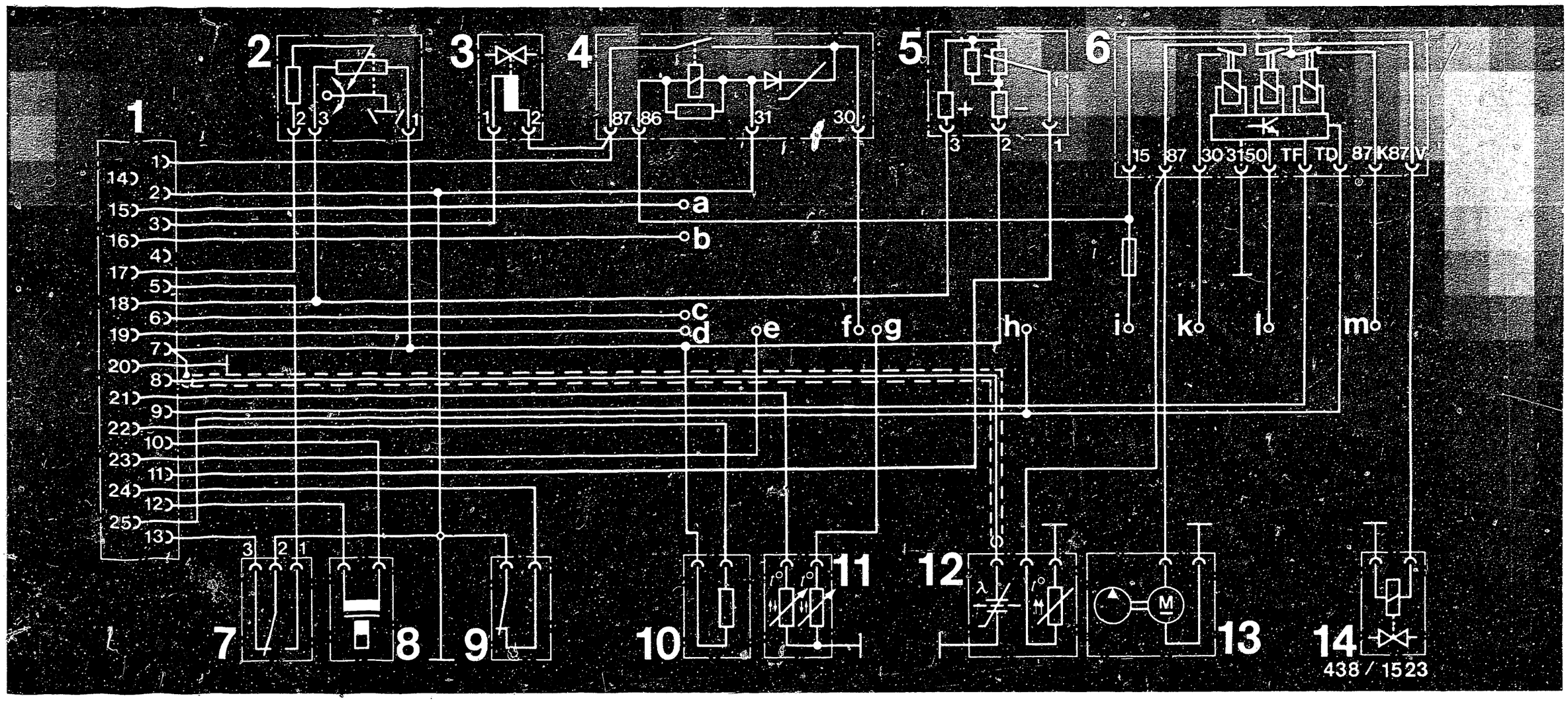
*) FD = Date of manufacture



1 = Control unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Idle actuator
4 = Over-voltage protection relay
5 = Altitude sensor
6 = Electronic relay for electric fuel pump and cold-start valve actuation
7 = Throttle-valve switch, idle/full load
8 = Electro-hydraulic pressure actuator
9 = Throttle-valve switch, idle/linkage
10 = Trimmer resistor, mixture map
11 = Temperature sensor, engine (Double NTC)
12 = Heated lambda sensor
13 = Electric fuel pump
14 = Cold-start valve

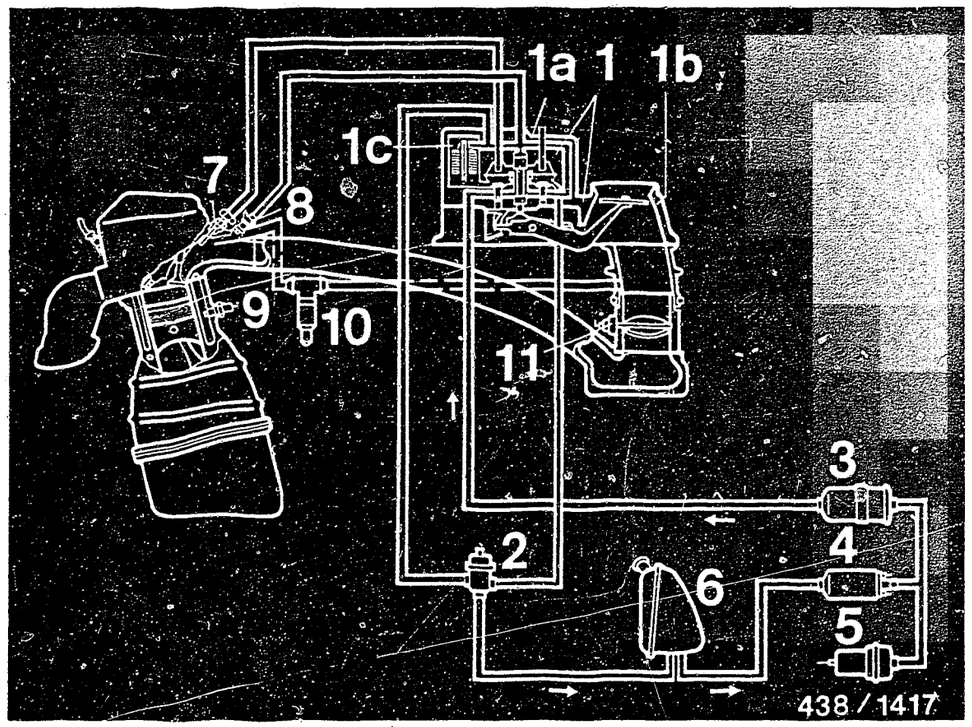
ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

B21 ⟹
B22 ⟺



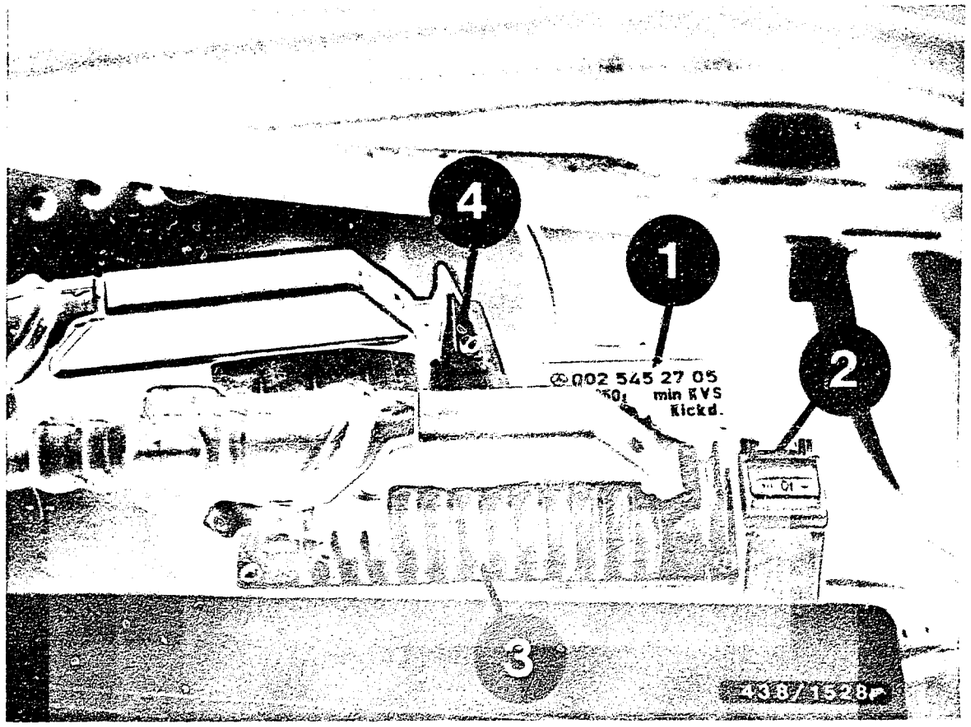
a = Lambda malfunction indicator
b = Transmission switch
c = Connection, Tempomat operating element
d = Connection, air-conditioner control unit
e = Lambda test output (diagnosis socket outlet, socket 3)
f = Terminal 30
g = Ignition system (EI)
h = Terminal TD, ignition
i = Terminal 15
k = Terminal 30
l = Terminal 50
m = Kick-down switch, socket 1

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT (CONTINUATION)



1 = Mixture-control unit
1a = Fuel distributor
1b = Air-flow sensor
1c = Electro-hydraulic pressure actuator
2 = Pressure regulator, primary pressure
3 = Fuel filter
4 = Electric fuel pump
5 = Fuel accumulator
6 = Fuel tank
7 = Injection valve
8 = Cold-start valve
9 = Temperature sensor engine (Double NTC)
10 = Idle actuator
11 = Throttle-valve switch, idle/full load

DIAGRAM OF AIR AND FUEL LINES



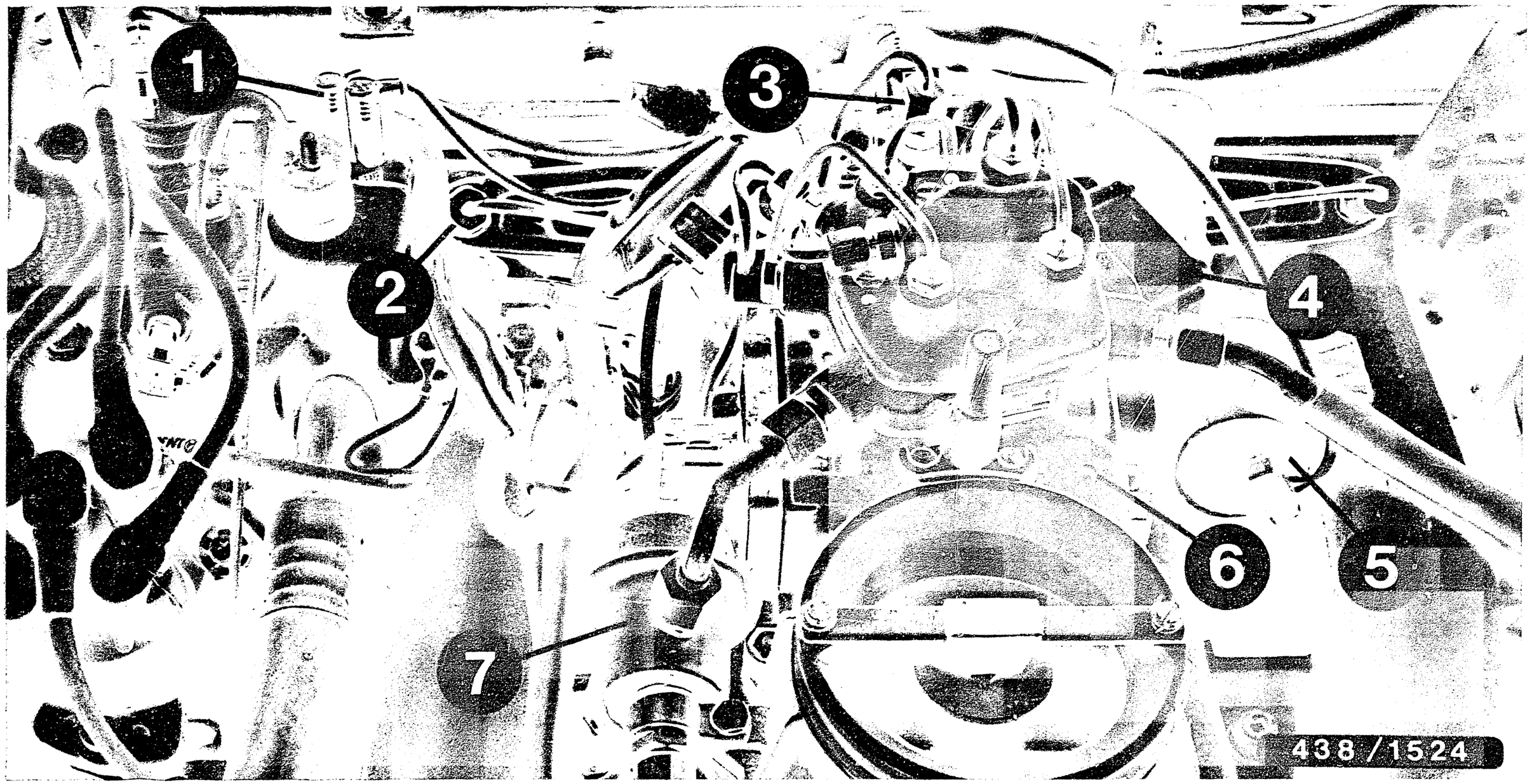
1 = Electronic relay for electric fuel pump and cold-start valve actuation

2 = Over-voltage protection relay

3 = KE-Jetronic control unit

4 = ABS controller (if present)

INSTALLATION POSITION OF COMPONENTS



1 = Engine temperature sensor
2 = Injection valves
3 = Cold-start valve
4 = Pressure actuator
5 = Idle actuator
6 = Mixture-control unit
7 = Pressure regulator

INSTALLATION POSITION OF COMPONENTS

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5001

BOSCH system : KE 3.1 - Jetronic

Make of vehicle : Mercedes

Basic microcard : MB-525

Note:
Items without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* These instructions contain the trouble-shooting instructions, valid at the time of publication, for the following model:

  MERCEDES-BENZ
  230E, 2,31/4-Zyl.-Mot. 03.85->
  190E 2.3, 2,3 1/4-Zyl.-Mot. 03.86->

* Trouble-shooting with theses instructions may only then take place when the details of the "Summary - Service Information for Vehicles" (KFZ-0..) coincide with those of the vehicle type and with the BOSCH number of the KE-Jetronic control unit installed.

* Control unit using digital techniques, characteristic-map control using microprocessor.

* Multi-functional fuel-management system with a characteristic map for operation with lambda closed-loop control (CAT) and a characteristic map for operation without lambda closed-loop control (ECE). Activation of the characteristic maps by trimming plug with corresponding marking. To set to the fuel grades unleaded regular and unleaded premium, only the ignition trimming plug must be re-connected.

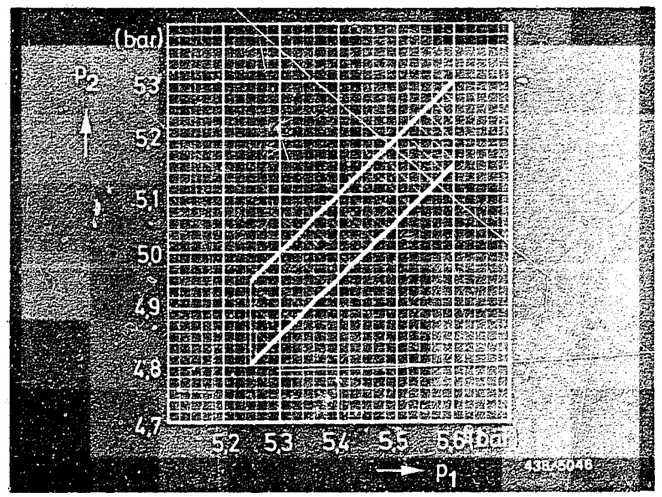
* Electronically controlled idle-speed control with single-winding rotary actuator, without bypass adjusting screw.

* Activated-carbon filter and regeneration valve for return of gasoline vapors into the intake manifold. (Fuel evaporation system)

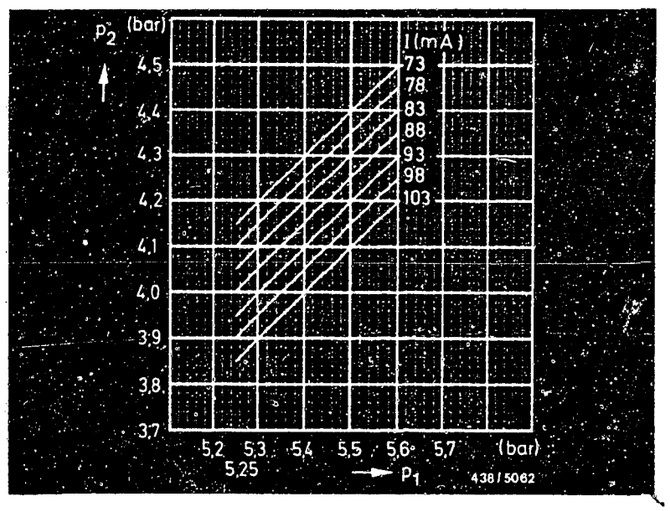
Important note:
If reference is made to a basic microcard, always make certain you use the test specifications from the vehicle-specific brief instructions.

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	at least 1100 cm ^{3} /min	
2	Primary pressure:	5,25...5,6 bar	
3	Differential pressure: Suppression of peak coil current: actuate starting motor with fuel-pump relay disconnected. Do not switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0.15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 2,7 bar 2,6 bar	
5	Injection valves, opening pressure:	3,0...4,1 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA) Idle: Part load: Full load: Min. delivery at max. air-flow sensor plate defl.:	Setting point: (cm ^{3} /min) 6,0 40,0 100,0 140 cm ^{3} /min	Max. permis. delivery: (cm ^{3} /min) 6,6 42,5 100,0



p_1 = Primary pressure
p_2 = Lower-chamber pressure

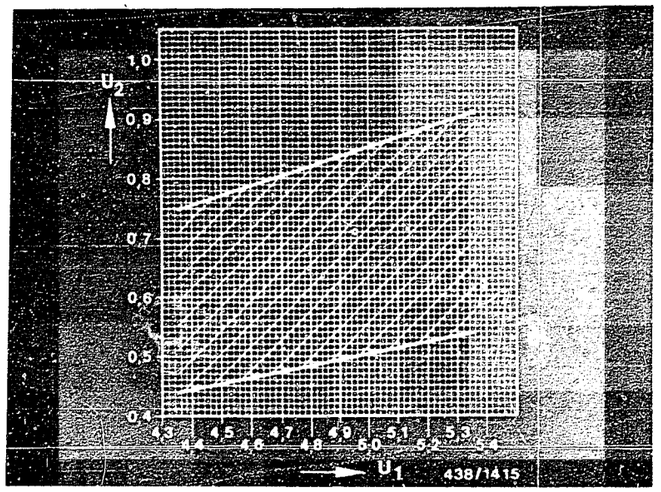


TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
7	Rate of flow, KE restriction:	130...150 cm^3 /min
8	Temperature sensor, air (NTC I): Air temperature +15...+30°C:	 1,3...3,6 k Ω
9	Temperature sensor, engine (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting: Fuel-distributor seat - needle bearing:	 20,9...21,6 mm
11	Idle adjustment: Low-idle-speed control: adjustment of idle-air delivery not possible. For testing, engine at norm. op. temp. Idle speed: Engage driving position, speed: Engage driving position and switch on air conditioner, speed: Only ECE: CO concentration in exhaust gas: Only CAT: Check lambda closed-loop control: Measurement with lambda closed-loop control tester (e.g. KDJE-P 600) and adapter lead (e.g. KDJE-P 600/52) at diag. socket outlet (pin3). Alternatively: Current measurement using universal test adapter. Put fuel evaporation system out of operation. On-off ratio fluctuating, mean value: Adjustment at idle-mixture-adjusting screw.	 700...800 min^{-1} 620...720 min^{-1} >720 min^{-1} 0,5...1,5 % CO by vol. 45...55 %

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
12	Signal, air-flow sensor potentiometer: (Checking necessary when poor idle and/or part-load behavior) Measurement using test adapter and voltmeter. Determine supply voltage of potentiometer: Set value (test adapter, V-position 10): Determine potentiometer signal at idle speed. (Test adapter, V-position 11) Set value corresponding to supply voltage: Adjust signal if necessary at trimming potentiometer (at right next to potentiometer pins). Afterwards, re-secure adjusting screw of trimming potentiometer using black sealing compound (e.g Teroson).	 4,35...5,35 V See chart



U_1 = Supply voltage potentiometer

U_2 = Potentiometer voltage signal

p1 = Primary pressure

p2 = Lower-chamber pressure

SELF-DIAGNOSIS

All Daimler-Benz 4- and 6-cylinder engines in the current series (approx. 10.85) are equipped with self-diagnosis using on-off ratio measurement.

Incorrect input signals from the KE-Jetronic control unit can be displayed with the lambda closed-loop tester at the lambda test output (diagnosis socket, socket 3).

This provides information on short and open circuits. Defects which occur sporadically (e.g. loose contacts) are not indicated. Output of fault signals has priority over output of the lambda closed-loop signal.

We will not go into the defects which can be indicated in more detail here, since the input signals of the KE-Jetronic control unit can be tested with the universal test adapter (rapid-diagnosis chart).

However, if when testing the lambda closed-loop control by means of on-off ratio measurement, a constant on-off ratio is indicated, then the input signals of the KE-Jetronic control unit should be tested (rapid diagnosis chart).

RAPID DIAGNOSIS CHART TO UNIVERSAL TEST ADAPTER ETT 018.01 WITH KE3 ADAPTER LEAD 1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the KE-Jetronic, including the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

The "Test specifications" column contains the test specifications for both the version without lambda closed-loop control (ECE, left-hand test-specifications column) and for the version with lambda closed-loop control (CAT, right-hand test-specifications column). Before starting testing, determine which version is being tested. If only one test specification is given, this applies to both versions.

Attention: When carrying out the test, make sure that the trimming plug is in position 1.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	V	4	–	Int. resistance(R_i) pressure actuator	12–10	Disconnect control-unit lead plug.	20...30 Ω
2	V	5	–	Resistor NTC II (engine)	21– 2	Engine temperature +15°...+30° C: approx. +80° C :	1,3...3,6 k Ω 250...390 Ω
3	V	6	–	Resistor NTC I (intake air)	11– 2	Air temperature in area of NTC I: +15°...+30° C:	1,3...3,6 k Ω
4				Signal, altitude sensor		Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	Test step not applicable!
5	V	9	–	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	0...10 Ω >1000 Ω
6	V	10	–	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	infinite Ω 0...10 Ω
7	V	11	–	Microswitch idle linkage	24– 2	Throttle valve closed: open:	0...10 Ω infinite Ω
8	V	12	–	Ground, control unit	20– 2		0...10 Ω
9	V	13	–	Ground, pin 7	7– 2	Switch off ignition. Connect control unit.	0...10 Ω

RAPID DAIGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
10	| V	14	–	Trimming plug mixture map	22– 2	Disconnect control-unit lead plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) with engine ground.		
						Trimming-plug position 1:	50... 60 Ω	900...1050 Ω
						2:	100...120 Ω	1200...1350 Ω
						3:	150...190 Ω	1500...1750 Ω
						4:	230...270 Ω	2000...2400 Ω
						5:	330...370 Ω	3000...3600 Ω
						6:	430...470 Ω	5000...5600 Ω
						7:	570...620 Ω	11000..12000 Ω
11	| V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer. Selection lever in position P, N:		0...10 Ω
						Driving position selected:		Infinite Ω
12	5	–	–	TD signal	25– 2	Start engine (starting motor):		Voltage indefined
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:		8...15 V
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:		8...15 V
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:		8...15 V
16	9	–	–	Air-conditioner cut-in signal	19– 2	Connect control unit. Start engine, switch on air conditioner. Temperature regulator = minimum temperature:		8...15 V
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:		4,35...5,35 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

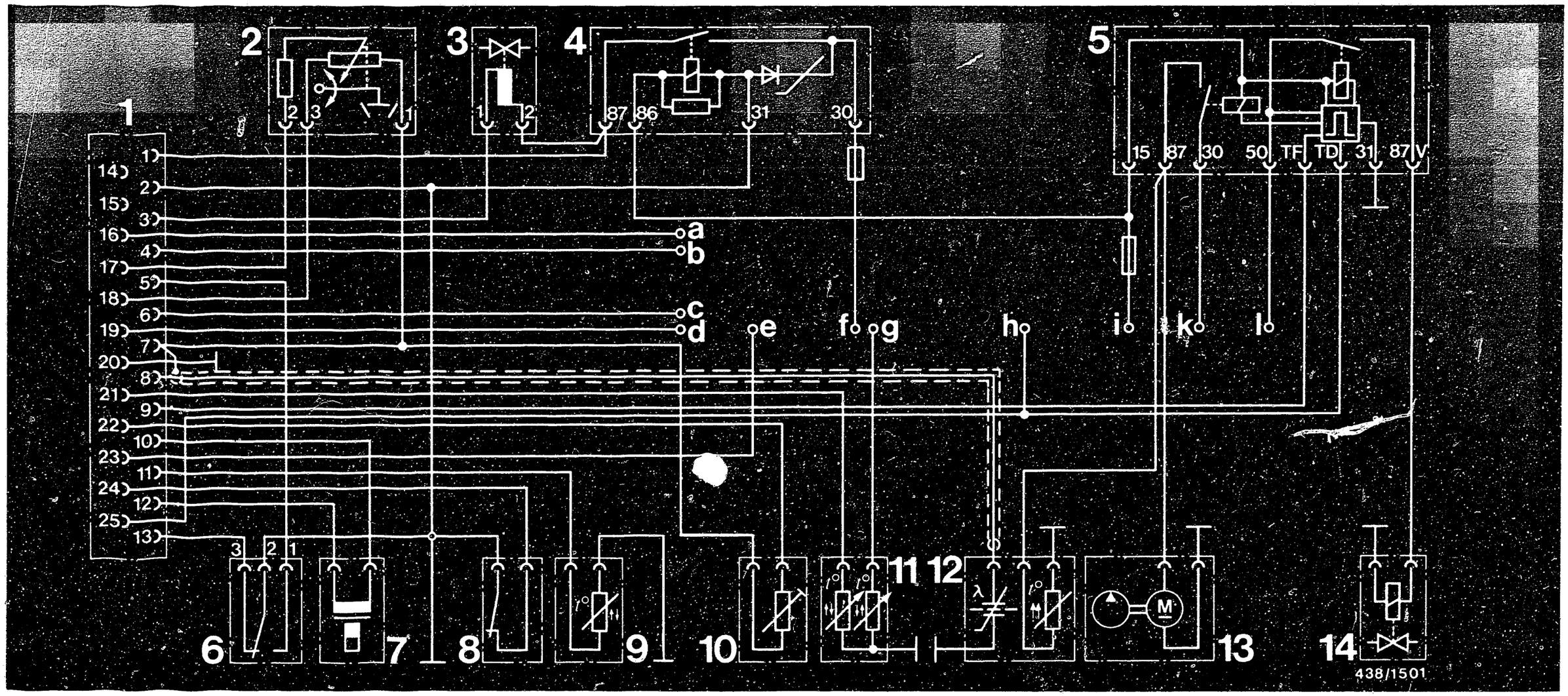
No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
18	11	–	–	Signal, air-flow sensor potentiometer	17– 2	Switch on ignition. Air-flow sensor plate in neutral position:	0 V	
						Deflect air-flow sensor plate by hand, continuous voltage rise up to max.:	5,35 V	
19	13	–	1	Temperature signal from control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V	
20	14	–	–	Consumption signal	4– 2	Start engine – idle:	Voltage indefined	
						With regulation:	Voltage change	
21	–	–	–	Peak coil current	12–12	Switch on ignition:	->FD 547: 90...110 mA FD548->: 9... 11 mA	->FD 547: 90...110 mA FD548->: 18... 22 mA
22	–	–	1	Warm-up enrichment	12–12	Warm up engine – idle. Current value with btn 1 pressed:	12...16 mA	4...8 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Engine at norm. op. temp., idle. Current value with btn 2 pressed:	–4...+7 mA	
						With CAT: oscillating, mean value:		–1...+1 mA
24	–	21	1	Starting enrichment	12–12	So that engine fails to start: Disconnect speed relay for electric fuel pump. Short circuit ignition coil term. 4 to ground via resistance of at least 2 k Ω (e.g. with sleeve-type suppressor and spark gap). While btn 1 pressed, actuate starting motor. Current rise (max. 1 sec.) to:	71...81 mA	61...71 mA

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
25	–	21	1	Post-start enrichment	12–12	Start engine (at normal op. temp. while actuating btn 1. Current value: Current value const. for approx.: Then slow speed regulation to:	 23...29 mA 2... 6 sec. 12...16 mA	 14...18 mA 2... 6 sec. 4... 8 mA
26	–	12	1	Acceleration enrichment	12–12	Engine at normal op. temp., idle. While actuating btn 1, perform snap acceleration of engine. Thus current rise (approx. 1 s) to: Note: Level of current value dependent upon intensity of acceleration (travel/duration of air-flow sensor flap movement).	 max. 60 mA	 max. 55 mA
27	–	–	–	Overrun cut-off	12–12	Re-connect ohmmeter (swap positive and negative). Start engine (normal op. temp.). Speed n to approx.: Hold there. Manually actuate idle throttle-valve switch (for 4- and 6-cyl. engines, microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:	 1800 min $^{-1}$ -40...-80 mA	 1800 min $^{-1}$ -40...-80 mA

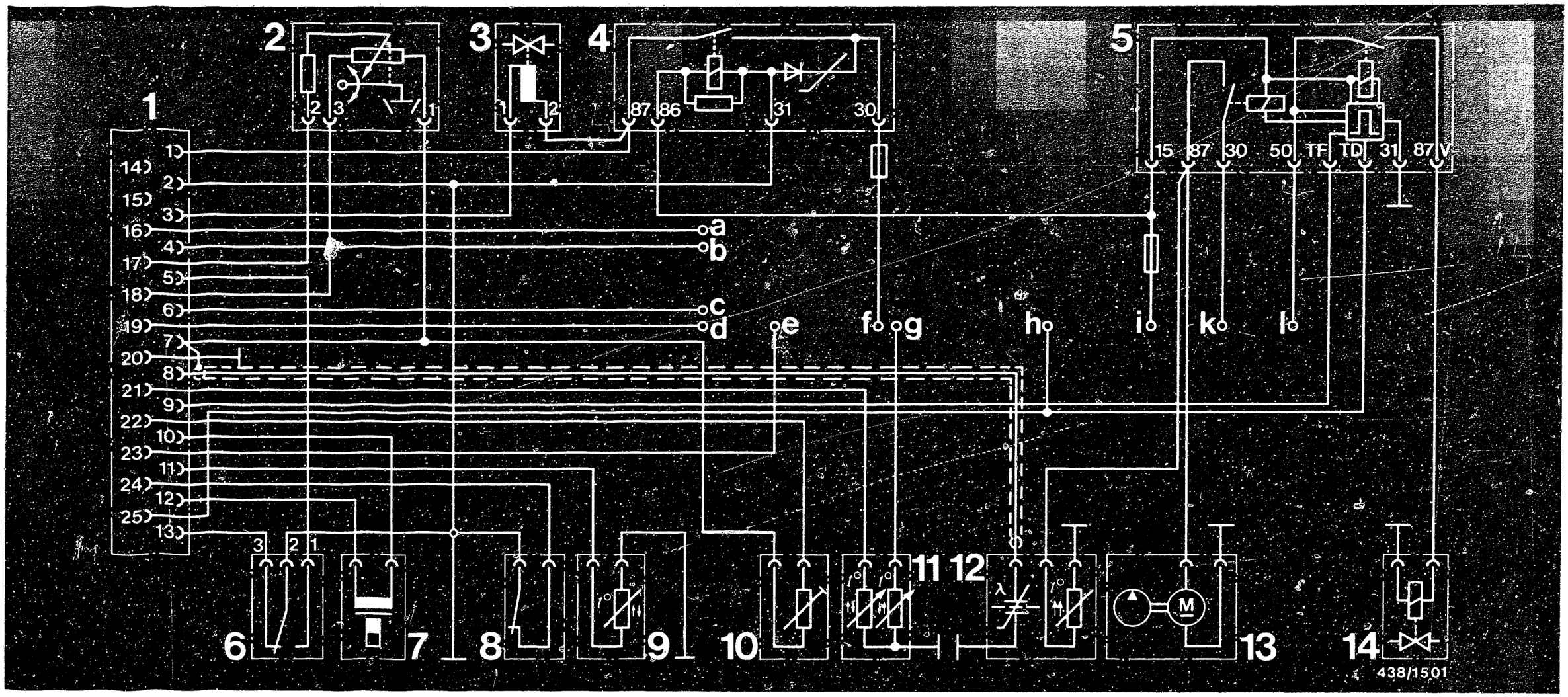
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
28	–	24	–	Full-load enrichment	12-12	Engine at normal op. temp., idle. Current value (ECE): With CAT, oscillating, mean value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: Attention: Do this very briefly, so that speed does not rise too much and engine is not damaged.	-4...+7 mA 3... 7 mA	-1...+1 mA 3... 7 mA
29	–	21	–	Lambda closed-loop control, open-loop control mode	12-12	Disconnect regeneration lead to throttle-valve assembly at generation valve and seal. Engine at norm. op. temp., idle. Current value:		-1...+1 mA
30	–	24	–	Lambda closed-loop control, closed-loop control mode	12-12	Engine at norm. op. temp., idle. Closed-loop control mode can be recognized from the oscillating current reading. Mean value: If mean value outside tolerance, set (idle-mixture-adjusting screw) to approx.:		-1...+1 mA approx. 0 mA
31	–	22	–	Lambda closed-loop control, rich stop	12-12	Engine at norm. op. temp., idle. Current rise to:		8...12 mA
32	–	23	–	Lambda closed-loop control, lean stop	12-12	Engine at norm. op. temp., idle. Current drop to:		-8...-12 mA



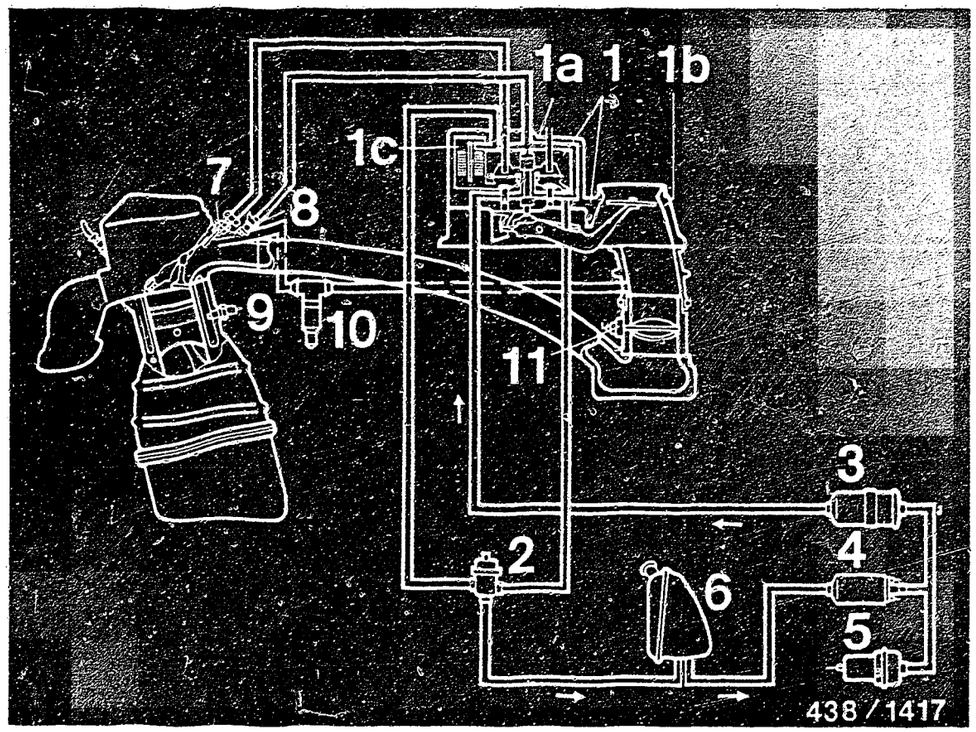
1 = Control-unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Idle actuator
4 = Over-voltage protection relay
5 = Electronic relay for electric fuel pump and cold-start valve actuation
6 = Throttle-valve switch, idle/full load
7 = Electro-hydraulic pressure actuator
8 = Throttle-valve switch, idle/linkage
9 = Temperature sensor, intake air (NTC I)
10 = Trimming plug, map adjustment
11 = Temperature sensor, engine (Double NTC)
12 = Heated lambda sensor
13 = Electric fuel pump
14 = Cold-start valve

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT



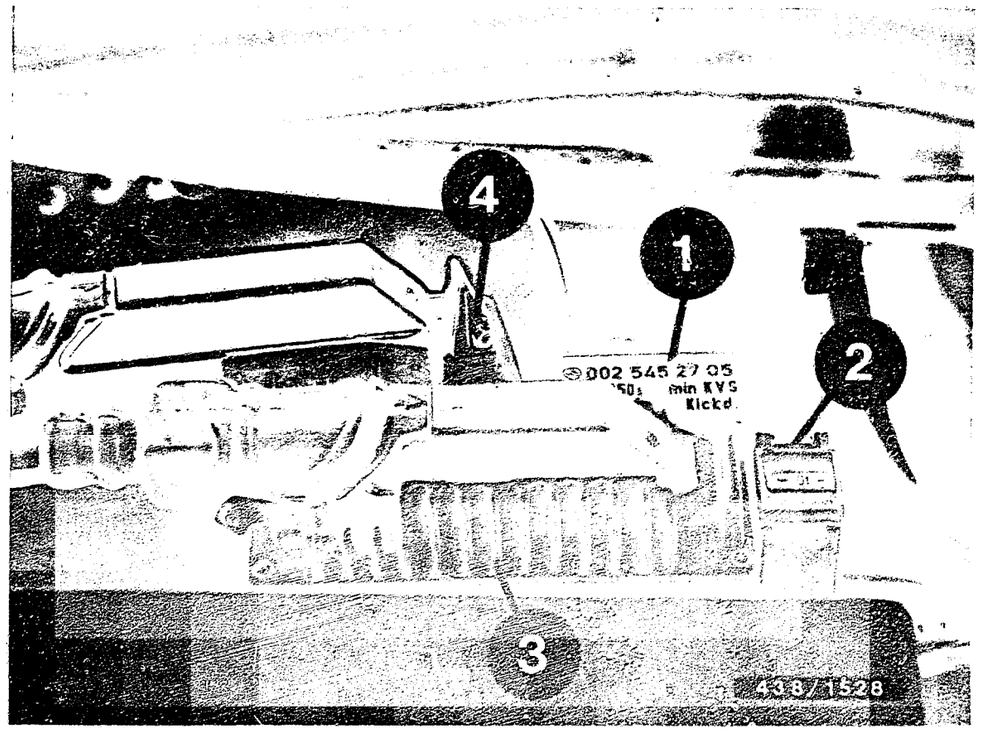
a = Transmission switch (only Automatic)
b = Consumption signal
c = Connection of Tempomat operating element
d = Connection of air-conditioner control unit
e = Lambda test output
f = Terminal 30 (B +)
g = Ignition system (EI-L)
h = TD signal, ignition
i = Terminal 15
k = Terminal 30 (B +)
l = Terminal 15a - starting motor

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT (CONTINUED)



1 = Mixture-control unit
1a = Fuel distributor
1b = Air-flow sensor
1c = Electro-hydraulic pressure actuator
2 = Pressure regulator, primary pressure
3 = Fuel filter
4 = Electric fuel pump
5 = Fuel accumulator
6 = Fuel tank
7 = Injection valve
8 = Cold-start valve
9 = Temperature sensor engine (Double NTC)
10 = Idle actuator
11 = Throttle-valve switch, idle/full load

DIAGRAM OF AIR AND FUEL LINES



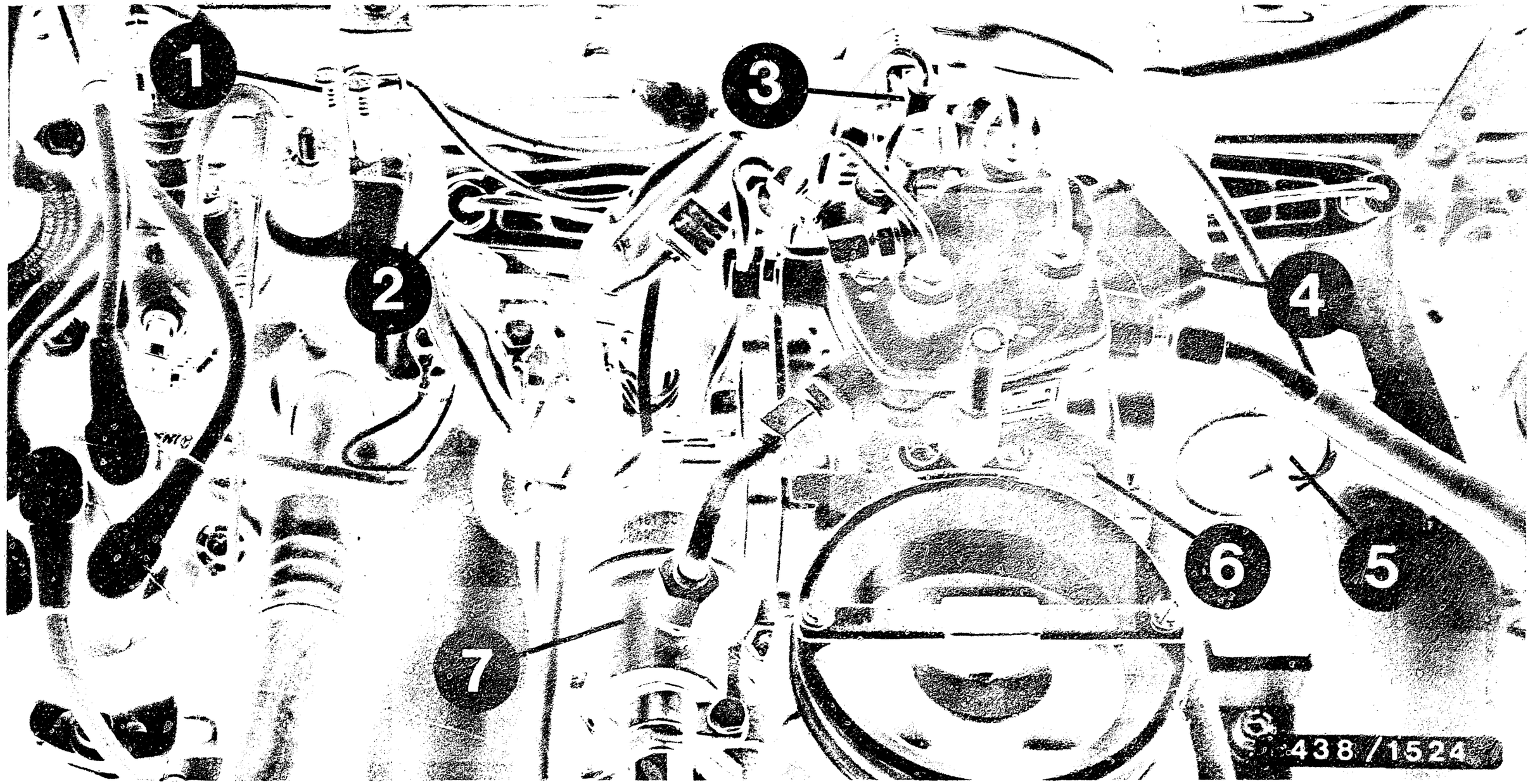
1 = Electronic relay for electric fuel pump and cold-start valve actuation

2 = Over-voltage protection relay

3 = KE-Jetronic control unit

4 = ABS controller (if present)

INSTALLATION POSITION OF COMPONENTS



1 = Engine temperature sensor
2 = Injection valves
3 = Cold-start valve
4 = Pressure actuator
5 = Idle actuator
6 = Mixture-control unit
7 = Pressure regulator

INSTALLATION POSITION OF COMPONENTS

T A B L E O F C O N T E N T S

Trouble-shooting instructions : POR-5001

BOSCH system : Motronic

Make of vehicle : PORSCHE

Basic microcard : POR-507

Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

The microcard contains the testing and repair instructions for:

* Porsche 944 (11.84->)
  2.51 / 4 cylinder engine,
  high-compression (10.6 : 1).
  Countries of application: world-wide except USA

New functions:

- Idle-mixture control (LFR).
- Lambda closed-loop control and altitude sensor (as of 6.85).
- Tank-ventilation system.
- Uniform control unit 0 261 200 076 as of 6.85 for vehicles with and without lambda closed-loop control and catalytic converter
- Variant encoding as of 6.85 in Motronic wiring harness.

Note

When using the basic microcard, the test specifications must always be taken from the vehicle-specific brief instructions.

Variant encoding
for control unit 0 261 200 076
In order to be able to use a uniform control unit for all national variants and vehicles with and without catalytic converter, terminals 10 and 30 in the wiring harness have been circuited differently. The Porsche firm offers an encoding plug (short-circuit bridge) and an adapter plug with 1,8 k Ω resistance for this purpose.
Porsche order number for
encoding plug: 944.612.525.00
adapter plug (1,8 k Ω): 944.612.421.00
With these plugs, the ignition and injection characteristic map is altered.
The appropriate connection plugs are found on the Motronic wiring harness near the control unit.
The long cable leads to control-unit term.30 and to ground. The short cable leads to control-unit term.10 and to ground. The altitude sensor is connected to term.1,8 (long cable) instead of the adapter plug (with 30 k Ω).

2.5 l engine, high-compression	Encoding plug at term.10	A = Altitude sensor at term.30 B = Adapter plug (1.8 k Ω) at term.30 C = Term.30 open
* ROW vehicles without cat. converter	no	B
Vehicles with catalytic converter	no	A or C
Switzerland, Sweden, and Germany (level A) without catalytic converter	yes	B

*ROW = Rest of world

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart makes it possible for the experienced Motronic specialist to rapidly test the electrical part of the system using the universal test adapter.

The rapid diagnosis chart contains the following information:

* Test-step sequence.
* Position of the V- and Ω -program switch.
* Remarks on operating the universal test adapter or other components.
* Test specifications for motortester and multimeter.

Note:
* Adapter cable 1 684 463 124 for vehicles without lambda closed-loop control.
* Adapter cable 1 684 463 128 for vehicles with lambda closed-loop control.

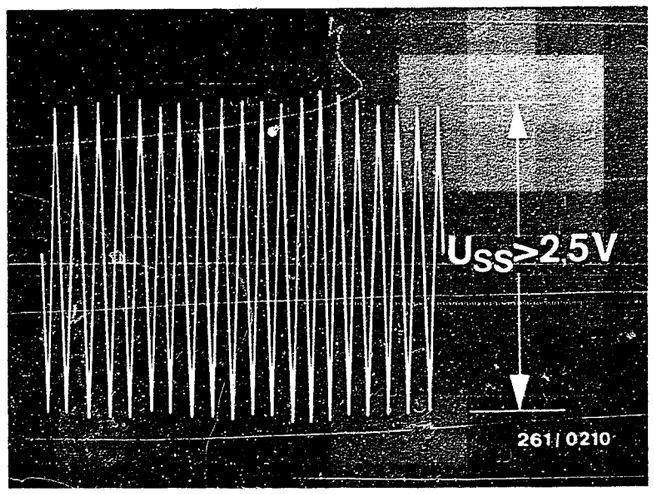
Adapter cable 1 684 463 124 can also be used for vehicles with lambda closed-loop control by way of replacement; however, the lambda test steps must be carried out in addition (see test steps POR-507, 43a, and 44a).

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)
Valid for control units 0 261 200 057 (without lambda closed-loop control)
0 261 200 076 (world-wide, with and without lambda closed-loop control)

Test step	Switch position V	Switch position Ω	Measurement	Control-unit plug between terms.	Remarks	Test specifications (reading)
1	V	1	Insulation resistance of engine-speed sensor	8 and 5	Disengage gear. Ignition off. Disconnect control unit and pump fuse no. 34.	greater than 1 M Ω
2	V	2	Insulation resistance of reference-mark sensor	25 and 5	—	greater than 1 M Ω
3	V	3	Winding resistance of engine-speed sensor	8 and 27	—	0,6...1,6 k Ω
4	V	4	Winding resistance of reference-mark sensor	25 and 26	—	0,6...1,6 k Ω
5	V	5	Resistance of temperature sensor II (engine)	13 and 5	Resistance temperature-dependent: (+ 15° C...+ 30° C) : (+ 80° C) :	 1,45...3,3 k Ω 280...360 Ω
6	V	6	Resistance of temperature sensor I (air)	22 and 5	Resistance temperature-dependent: (+ 15° C...+ 30° C) : (+ 80° C) :	 1,45...3,3 k Ω 280...360 Ω
7	V	7	Resistance of characteristic-map switch	10 and 5	For Sweden/Switzerland/Germany level A: For vehicles with catalytic converter:	less than 10 Ω greater than 1 M Ω
8	V	8	Not applicable	—	—	—
9	V	9	Throttle-valve sensor: resistance of idle contact.	2 and 5	Accelerator pedal at rest : Throttle valve slightly open:	less than 10 Ω greater than 1 M Ω
10	V	10	Throttle-valve switch: resistance of full-load contact	3 and 5	Completely depress accelerator pedal	less than 10 Ω

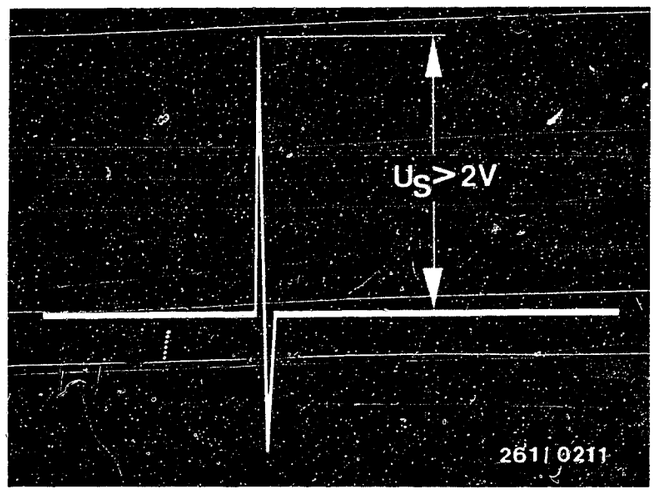
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Test step	Switch position V	Switch position Ω	Measurement and remarks	Control-unit plug between term.	Test specifications (reading)
11	| V	11	Resistance of ground cable	16 and 5	Smaller than 10 Ω
12	| V	12	Resistance of ground cable	17 and 5	Smaller than 10 Ω
13	| V	13	Resistance of ground cable	19 and 5	Smaller than 10 Ω
14	| V	14	Resistance at input for altitude correction. Vehicles without lambda closed-loop control: Vehicles with lambda closed-loop control or with control unit 0 261 200 057 Vehicles with altitude sensor, switch open (below 1.000 m altitude) Vehicles with altitude sensor, switch closed (above 1.000 m altitude)	30 and 5	 1,6...2 k Ω Greater than 1 M Ω Greater than 1 M Ω Smaller than 10 Ω
15	| V	15	Resistance of driving-position switch.	28 and 5	Smaller than 10 Ω
16	1	15	Speed-sensor signal using oscilloscope. Shift into neutral and start.	8 and 27	See upper illustration
17	2	15	Reference-mark sensor signal using oscilloscope. Shift into neutral and start.	25 and 26	See lower illustration



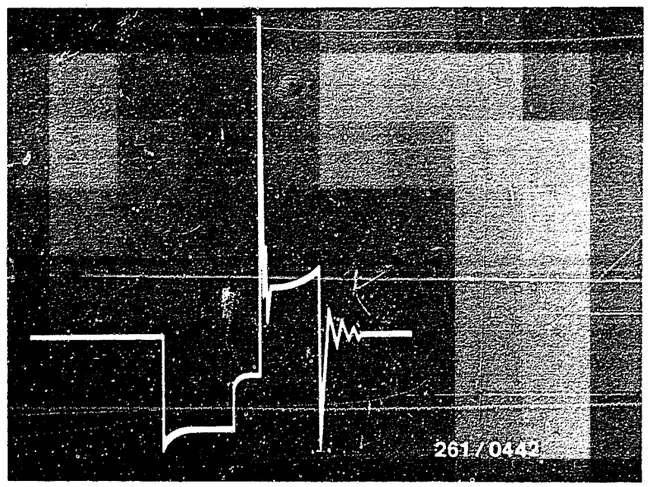
Engine-speed sensor signal

Reference-mark sensor signal



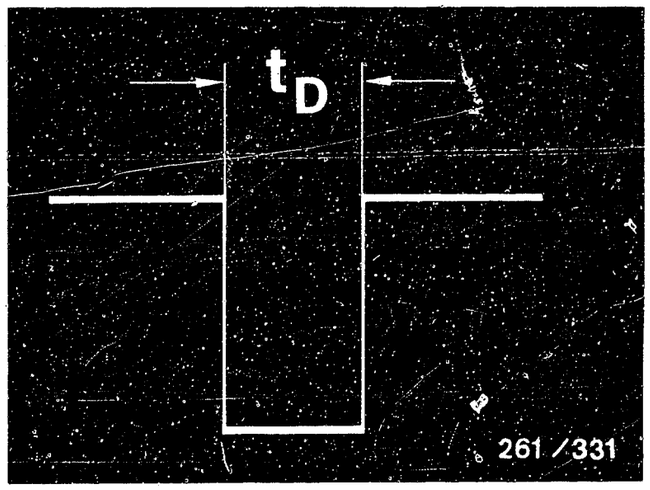
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Test step	Switch position V	Switch position Ω	Measurement and remarks	Control-unit plug between terms.	Test specifications (reading)
18	3	15	Not applicable	10 and 5	——
19	4	15	Voltage of air conditioner (if present). Switch on air conditioner.	29 and 5	greater than 8 V
20	6	15	Voltage of main relay. Ignition on.	35 and 5	10...15 V
21	7	15	Voltage of main relay. Ignition on.	18 and 5	10...15 V
22	5	15	Ignition signal from ignition coil, using oscilloscope. Ignition off. Connect control unit. Disengage gear and start.	1 and 5	Signal present. (see upper illustration)
23	8	15	Supply voltage for air-flow sensor. Ignition on.	9 and 5	greater than 4,5 V
24	9	15	Wiper voltage of potentiometer in air-flow sensor. Ignition on.	7 and 5	Sensor flap at rest: 200...300 mV Sensor flap open all the way: greater than 4,2 V
25	10	15	Not applicable	——	——
26	11	15	Not applicable	——	——
27	12	15	Term. 50 starting signal. Disengage gear and start.	4 and 5	8...15 V
28	13	15	Dwell-time signal (output) using oscilloscope. Disengage gear and start.	21 and 5	see lower illustration



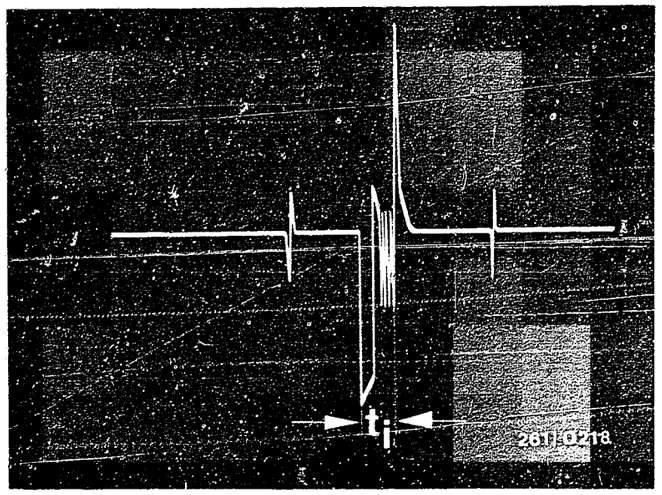
Ignition signal

t_D = Dwell period

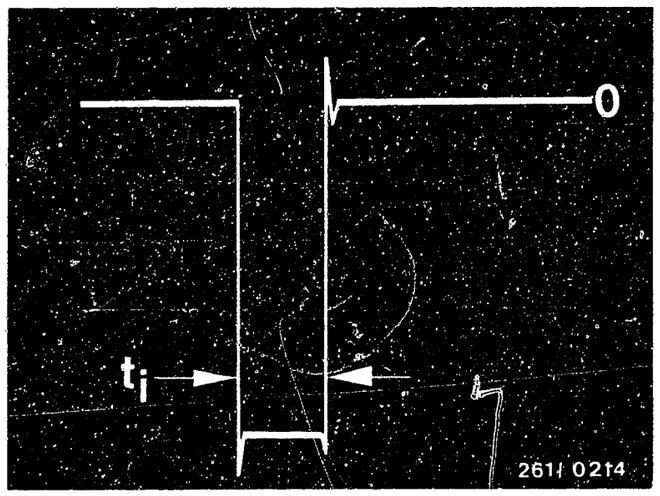


RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Test step	Switch position V	Switch position Ω	Btn	Measurement and remarks	Measurement at control-unit plug between terms.	Test specs. (reading)
29	14	15	–	Injection signal from control unit, using oscilloscope. Disengage gear and start.	14 and 5	See upper illustration
30	14	15	T1	As 29, except after pressing button (NTC II, cold) injection duration becomes somewhat longer. Press button only about 2 secs.	14 and 5	See upper illustration; t_i becomes somewhat wider
31	15	15	–	As test step 29, except 2nd output for fuel-injection valves.	15 and 5	See upper illustration
32	16	15	–	Fuel-injection signal from control unit, using oscilloscope. Disengage gear and start.	11 and 5	See lower illustration
33	17	15	–	Voltage at pump relay. Plug in pump fuse. Ignition on.	20 and 5	10...15 V
34	17	15	–	Voltage at pump relay. Test of pump control in control unit. Disengage gear and start.	20 and 5	max. 4 V
35	17	15	T3	Fuel-pressure test: Ignition off. Connect pressure gauge to test connection. Ignition on. Press button T3.	20 to ground	2,3...2,7bar

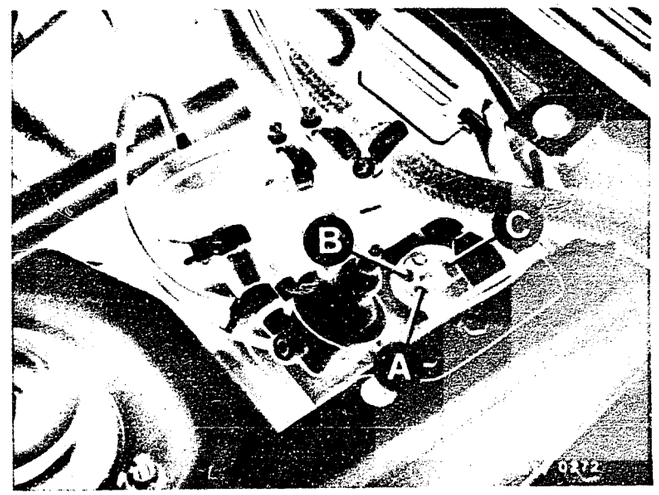


t_i = Duration of injection



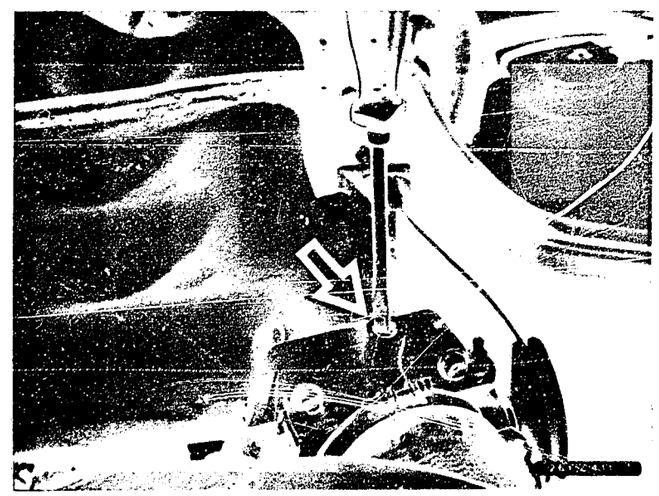
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Test step	Switch position V	Switch position Ω	Btn	Measurement and remarks	Control-unit plug terms.	Test specifications (reading)
36	17	15	–	Test CO and idle speed: connect motortester and diagnostic cable (1 684 463 095 or ..158). On vehicles with lambda closed-loop control, connect CO tester to test connection before catalytic converter (in engine compartment on right). When testing with adapter cable 1 684 463 124, disconnect plug connection of lambda sensor. First carry out CO testing. Engine temperature about 90°C, intake-air temperature approx. +15...30°C, consuming devices switched off. Carry out adjustments rapidly.	———	Vehicles without lambda closed-loop control: 0,5...1,5 vol. % CO Vehicles with lambda closed-loop control: 0,4...0,8 vol. % CO
			T5 and T6	For idle-speed testing and adjustment at test socket, connect terms. B and C with lead or press buttons T5 and T6 simultaneously, and read off test result. Remove lead from test base or release buttons, give snap acceleration and check idle speed.		800...880 min^{-1}



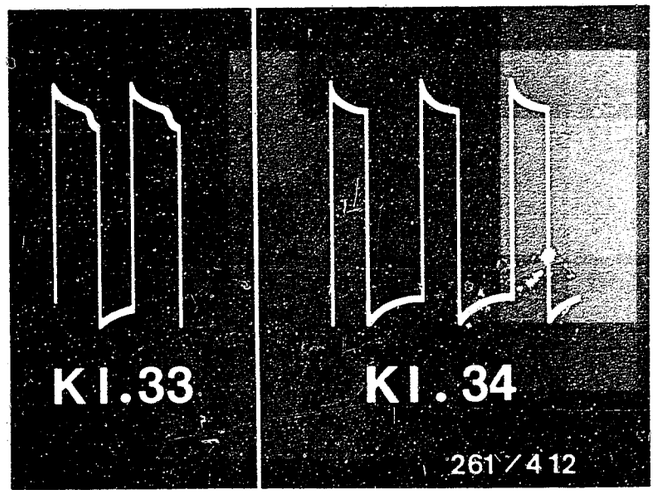
A, B, C = Terminal of test socket

Arrow = Adjusting screw for idle speed



RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Test step	Switch position V	Switch position Ω	Btn	Measurement and remarks	Measurement at control-unit plug between terms.	Test specs. (reading)
37	17	15	–	Test ignition timing at idle speed: operate engine at operating temperature at an idle speed of (800...880 min $^{-1}$). Idle speed must be set exactly, otherwise incorrect ignition timing will be shown.	—	Term.30 to 1,8 k Ω : 5°...15° Term.30 open or to ground: 0°...10°
38	17	15	T6	Test ignition timing at full load: engine at operating temperature. Set engine speed to 3000 min $^{-1}$. Press button T6.	3 to ground	At 3000 min $^{-1}$ with out lambda closed-loop control: 18°...28° With lambda closed-loop control: 13°...23°
39	17	15	–	Dwell angle at idle speed	—	10°...16°
				Dwell angle at 2000 min $^{-1}$	—	18°...28°
40	17	15	T5	Check overrun cutoff: Maintain constant engine speed of 3000 min $^{-1}$. Press button T5. Fuel-injection signals discontinue and engine speed fluctuates rythmically.	2 to ground	Engine "surges"
41	18	15	–	Signal at idle actuator. Operate engine at idle speed.	33 and 5	See upper illustration
42	19	15	–	Signal at idle actuator. Operate engine at idle speed.	34 and 5	See upper illustration



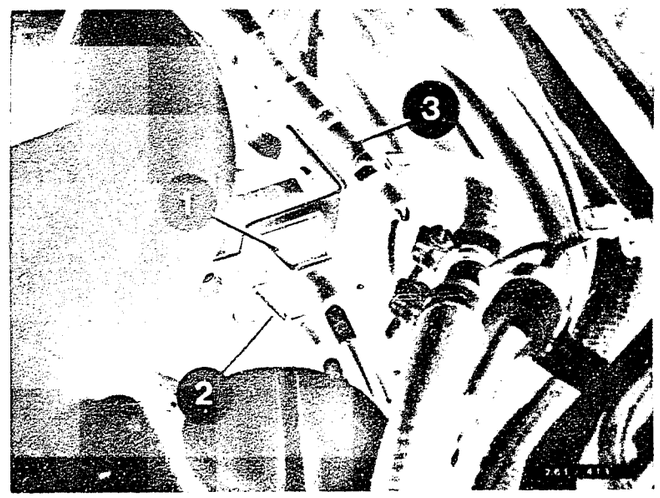
Signals at idle actuator

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Test step	Switch position V	Switch position Ω	Measurement and remarks	Control-unit plug terms.	Test specifications (reading)
The following test steps apply only to vehicles with lambda closed-loop control. Testing of lambda closed-loop control can be carried out as follows: 1. With adapter cable 1 684 463 128, see test steps 43, 44, 45. 2. Without test adapter, if only adapter cable 1 684 463 124 is available for testing the Motronic, see test steps 43a,, 44a,, 45. With both test methods, connect the CO tester before the catalytic converter and operate engine at operating temperature at idle speed.					
43	20	22	Testing with adapter cable 1 684 463 128: Upper limit of lambda closed-loop control is tested. Test adapter connects term. 24 of control unit to ground. This test step must be carried out quickly in order to prevent damage to the catalytic converter.	24 to ground	CO rises above 1,5 vol.%CO
44	20	23	As test step 45, except lower limit of lambda closed-loop control. Test adapter applies + 2 V to term. 24 of control unit.	24 to +2V	CO falls below 0,4 vol.%CO Uneven engine running
45	20	24	Test of lambda sensor in closed-loop operation. Test adapter connects term. 24 of control unit with lambda sensor.	24	0,4...0,8 vol.% CO
			As above, except disconnect air hose at pressure regulator and seal off. Immediately observe CO value.		CO value rises briefly and then falls back to control value above.

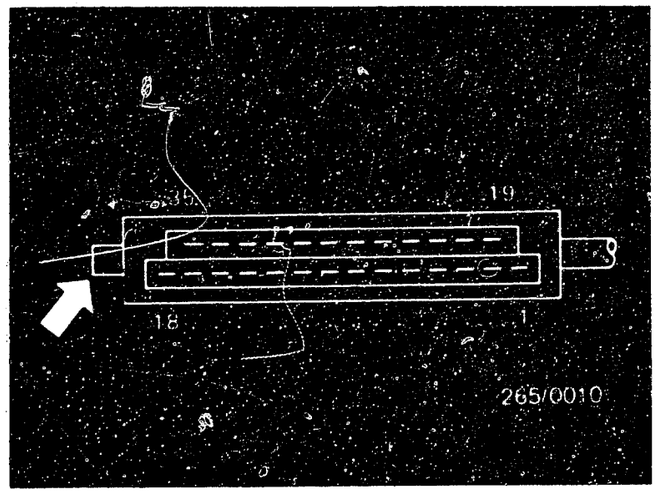
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER (CONTINUED)

Test step	Measurement and remarks	Test spec. (reading)
Testing of lambda closed-loop control without test adapter		
43a	The upper limit of lambda closed-loop control is tested. Separate the lambda-sensor plug connection and connect the lead to the control unit (term.24) to ground. Carry out this test step only briefly, to prevent damage to the catalytic converter.	CO rises above 1,5 vol.%
44a	The lower limit of lambda closed-loop control is tested. Connect the disconnected lead to the control unit (term.24) to approx. + 2 V (e.g. 1.5 V single-cell battery, positive to term.24, negative to vehicle ground).	CO falls below 0,4 vol.%, uneven engine running
45a	The lambda sensor is tested in closed-loop operation. Reconnect the lambda-sensor plug connection.	0,4...0,8 vol.% CO
	As above, except pull off air hose at pressure regulator and seal. Immediately observe CO value.	CO value briefly rises and falls back to above control value.



1 = Plug connection for speed sensor
2 = Plug connection for reference-mark sensor
3 = Plug connection for lambda sensor

Top view of control-unit plug (35-pin) with terminal numbers.
Arrow = Lug with mechanical coding



Pressure regulator
Fuel pressure: 2,3...2,7 bar

Electric fuel pump
Delivery quantity
(measured in return flow): min. 850 cm ^{3} /30s
Connection voltage
(under load): min. 12 V

Temperature sensor I (air)
Electrical internal resistance
measured at air-flow sensor
between terms.22(1) and 6(4)
at ambient temperature
(+15°C...+30°C): 1450...3300 Ω

Temperature sensor II (engine)
Plug color blue.
Electrical internal resistance at
ambient temperature
(+ 15° C...+ 30° C): 1450...3300 Ω
Engine at operating temperature
(approx. + 80° C): 280... 360 Ω

Solenoid-operated fuel-injection valve
Electrical internal resistance
at ambient temperature
(+ 15° C...+ 30° C): 2... 3 Ω

Air-flow sensor
Electrical internal resistance between:
term.7(2) and term.6(4): 8...1000 Ω (*)
term.9(3) and term.6(4): 500... 800 Ω

(*) Deflect sensor flap to stop.

Engine-speed sensor and reference-mark sensor
Electrical internal resistance at
ambient temperature
(+15°C...+30°C): 600...1600 Ω

Throttle-valve switch
Resistance of idle contact
(term.1 and term.2): 0 Ω
Resistance of full-load
contact (term.3 and term.2): 0 Ω

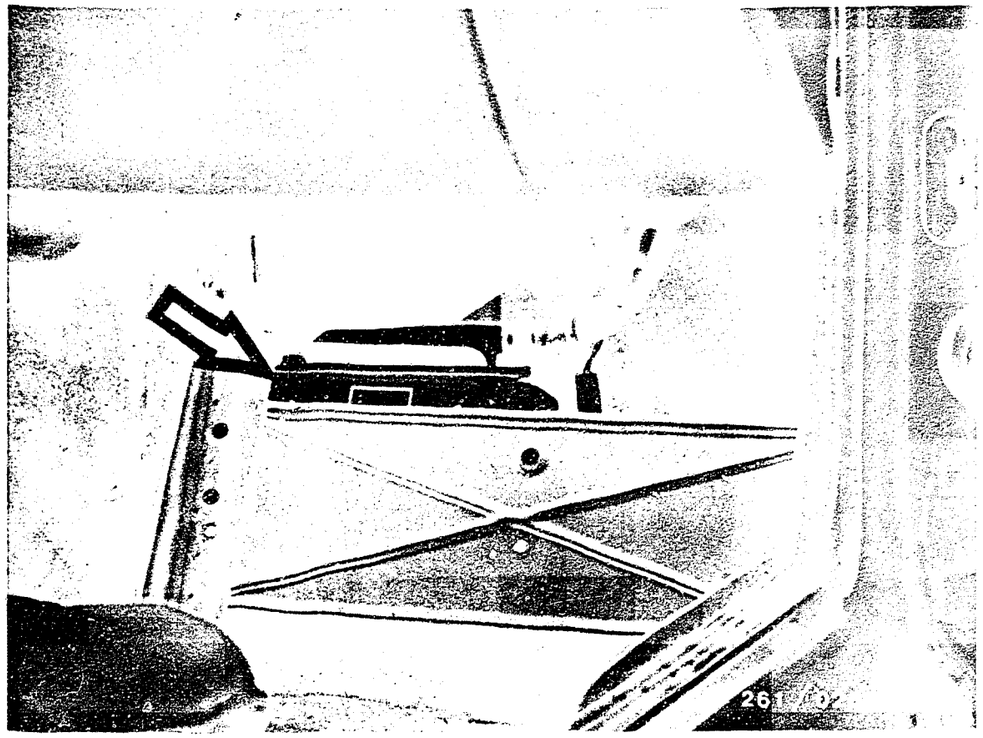
Altitude sensor
Above altitude of 1000 m,
contact is closed: 0 Ω
Below altitude of 1000 m,
contact is open: infinite Ω

Idle actuator
Electrical internal resistance at ambient temperature
(+15°...+30°C) between
term.4 and term.5: 17...19,5 Ω
term.4 and term.3: 19...21,5 Ω

Lambda sensor
Resistance of heating winding: 6...20 Ω

Idle adjustment
Engine at operating temperature.
Ambient temperature + 15°...+35°C.
Switch off consuming devices.
Idle speed: 800...880 min $^{-1}$
(bridge terms.B and C
on test socket)
CO concentration:
without catalytic converter: 0,5...1,5 vol.% CO
with catalytic converter: 0,4...0,8 vol.% CO
(measure CO before catalytic converter,
disconnect lambda-sensor plug).

For setting values for valve clearance and other technical engine data, see equipment and Autodata microcard.



Arrow = Control unit

INSTALLATION POSITION OF COMPONENTS

Installation-position information is always with reference to the direction of vehicle travel.

* Control unit:
  On the passenger side behind footwell cover.

* Altitude sensor or adapter plug with 1.8 k Ω :
  Behind glove compartment.

* Motronic (DME) relay (main and pump relay):
  In central electrics console, DME relay (G5) in engine compartment on left.

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

* Engine-speed and reference-mark sensor:
  On crankcase flange beneath oil filler inlet.

* Temperature sensor I (air):
  In air-flow sensor.

* Temperature sensor II (engine):
  On the left side of the engine, between cylinders 1 and 2 (blue plug).

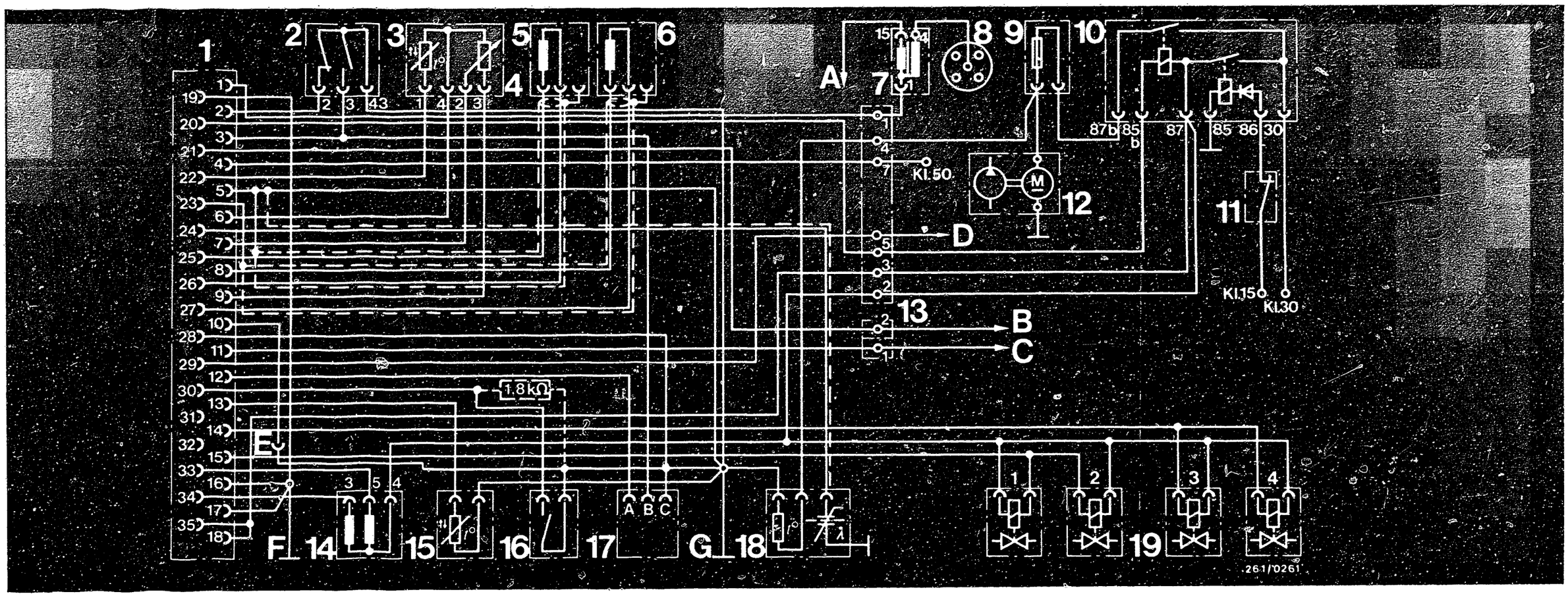
* Ground terminals:
  On clutch housing and engine compartment near engine-speed and reference-mark sensor.

* Idle actuator:
  Below intake distributor.

* Lambda sensor:
  In common exhaust pipe before catalytic converter

* Temperature switch +58°C:
  Below intake manifold on 4th cylinder.

* Throttle-valve switch:
  On throttle-valve assembly.



ELECTRICAL TERMINAL DIAGRAM

1 = Control-unit plug
2 = Throttle-valve switch
3 = NTC temperature sensor I (air)
4 = Air-flow sensor
5 = Reference-mark sensor
6 = Engine-speed sensor
7 = Ignition coil
8 = High-voltage distributor
9 = Fuse no. 34 in central electrics console
10 = Pump and main relay (G5 in central electrics console)
11 = Alarm system
12 = Electric fuel pump
13 = Plug connection in engine compartment
14 = Idle actuator
15 = NTC temperature sensor II (engine)
16 = Without catalytic converter: Adapter plug connected with 1.8 k Ω . Term.30 open with control unit 0 261 200 057

With catalytic converter: Altitude sensor (as pictured) or term. 30 open

17 = Test socket
18 = Lambda sensor (at present) heated, or dummy plug on vehicles equipped for catalytic converter
19 = Solenoid-operated fuel-injection valves (cyl. 1, 2, 3, 4)
A = To central electrics console
B = To engine-speed sensor
C = To consumption indicator
D = To air conditioner (B+)
E = Characteristic-map plug: general : open
Sweden/Switzerland/Germany (level A): plugged
F = Ground, clutch housing
G = Ground, engine blocked

Always pay attention to SAFETY AND PRECAUTIONARY MEASURES in order to avoid damage to the engine, control unit or ignition coil, as well as to prevent danger to persons.

1. CAUTION!
   High-output ignition system with dangerous high and low voltages!

   Contact with components or terminals under voltage may be dangerous (both at the primary and secondary ends).

2. When testing the compression, disconnect the Motronic relay. In this way, undesired injection by the injection valves is avoided.

3. Never start engine when battery not firmly connected.

4. Incorrect polarity of the supply voltage, e.g. through incorrect connection of the battery or ignition coil, may lead to the destruction of the control unit.

5. Never use a fast charger for starting the engine. Provide starting aid only using a second 12 V battery and jump leads.
   Caution! Due to non-uniform demands of the vehicle manufacturer made on electronic products, we recommend that a 24 V battery never be used for providing starting aid. Observe the vehicle owner's manual.

6. Disconnect the battery from the vehicle electrical system before boost charging.

7. When charging the battery in the vehicle or providing starting aid, observe the instructions in the operating manual of the fast charger, as well as the instructions from the vehicle manufacturer.

8. Never disconnect the battery from the vehicle electrical system when the engine is running.

9. Never short circuit ignition coil term. 1 to ground (e.g. for switching off the engine). Ignition coil and, under certain circumstances, control unit are destroyed.

10. Never connect the positive battery terminal to ignition coil term. 1. Control unit is destroyed.

11. Never diconnect or connect wiring-harness plug of control unit when ignition is switched on.

12. When temperatures are above +80°C (drying oven), the control unit must be removed.

13. When welding (electric spot welding), the control unit must be removed.

14. When installing an alarm system, observe the installation instructions for Motronic vehicles or the SIS microcard ALL-500.
    Make sure that the alarm relay is not destroyed by external fields (e.g. from ignition cables) so that it responds in a defective manner.

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5002

BOSCH system : Orthopaedic seat backrest

Make of vehicle : MERCEDES-BENZ

Basic microcard :

Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

This microcard contains the testing and repair instructions for the orthopaedic seat backrest in the Mercedes-Benz passenger-car types
190, E, 280 S...500 SEL.

For production reasons:
continued on the following
coordinate.

RAPID DIAGNOSIS CHART FOR ORTHOPAEDIC SEAT BACKREST

The rapid diagnosis chart makes it possible for the experienced expert to check the orthopaedic seat backrest using the pressure-vacuum tester.
The contents of this chart are limited to the following details:

* Test step sequence
* Adjustment instructions and test specifications
* Information on the coordinates of the respective test program and trouble-shooting program.

The pressure-vacuum tester is connected in each case to the specified connection between the control valve and hose plug (use suitable T-piece).
The rest of the leads remain connected to the control valve.

If detailed information and instructions are necessary, always proceed after testing starting at coordinate B1.

TEST REQUIREMENT

* Centralized locking system O.K.
* Vehicle electrical system voltage greater than 10 V

RAPID DIAGNOSIS CHART FOR PRESSURE-VACUUM TESTER (ETT 007.00 and ETT 007.01)

Test step	Under test	Remarks, test instructions	Test specifications (reading)	Trouble-shooting, see coordinates
1	Bi-pressure pump, pressure supply line with pressure reservoir	Connect pressure-vacuum tester (terminal D) at control-valve hose plug (terminal p) using suitable intermediate piece. Pressure-vacuum tester in position D: Switch on ignition.	470...590 mbar	
2	Control valve with air cushion 1	Connect pressure-vacuum tester (terminal D) at control-valve hose plug (terminal 1). Control valve in position A. Switch on ignition. Set 200 mbar at control valve using selector wheel.	170...250 mbar Permissible pressure drop smaller than 100 mbar/min	
3	Control valve with air cushion 2	Connect pressure-vacuum tester (terminal D) at control-valve hose plug (terminal 2). Control valve in position B. Switch on ignition. Set 200 mbar at control valve using selector wheel.	170...250 mbar Permissible pressure drop smaller than 100 mbar/min	
4	Control valve with air cushion 3	Connect pressure-vacuum tester (terminal D) at control-valve hose plug (terminal 3). Control valve in position D. Switch on ignition. Set 200 mbar at control valve using selector wheel.	170...250 mbar Permissible pressure drop smaller than 100 mbar/min	
5	Control valve with air cushion 4	Connect pressure-vacuum tester (terminal D) at control-valve hose plug (terminal 4). Control valve in position E. Switch on ignition. Set 200 mbar at control valve using selector wheel.	200 mbar Permissible pressure drop smaller than 15 mbar/min	

TEST SPECIFICATIONS

Bi-pressure pump

Power consumption under load:
(at 13±0,2 V and 0,5±0,05 bar, smaller than 5 A
vacuum/overpressure)

Peak-coil-current consumption:
Normal	smaller than 1 mA
Interrupted	smaller than 5 mA

Response time of pump: less than 300 ms

Switching points of pressure switch:
Overpressure	0,5±0,05 bar
Vaccum	0,5±0,05 bar

(with pressure reservoir
selected 0,26 dm3)

Pressure rise: 0,5 bar in less than 3 s
(at 11...15 V and with pressure
reservoir selected 0,26 dm3)

Safety time: 25...150 s
(e.g. when there is a leak in
the system, the pump must switch off)

Pressure drop at control valve
and air cushion:
170...250 mbar at control-valve adjustment:
Pressure drop 150 mbar/min

For production reasons:
continued on the following
coordinate.

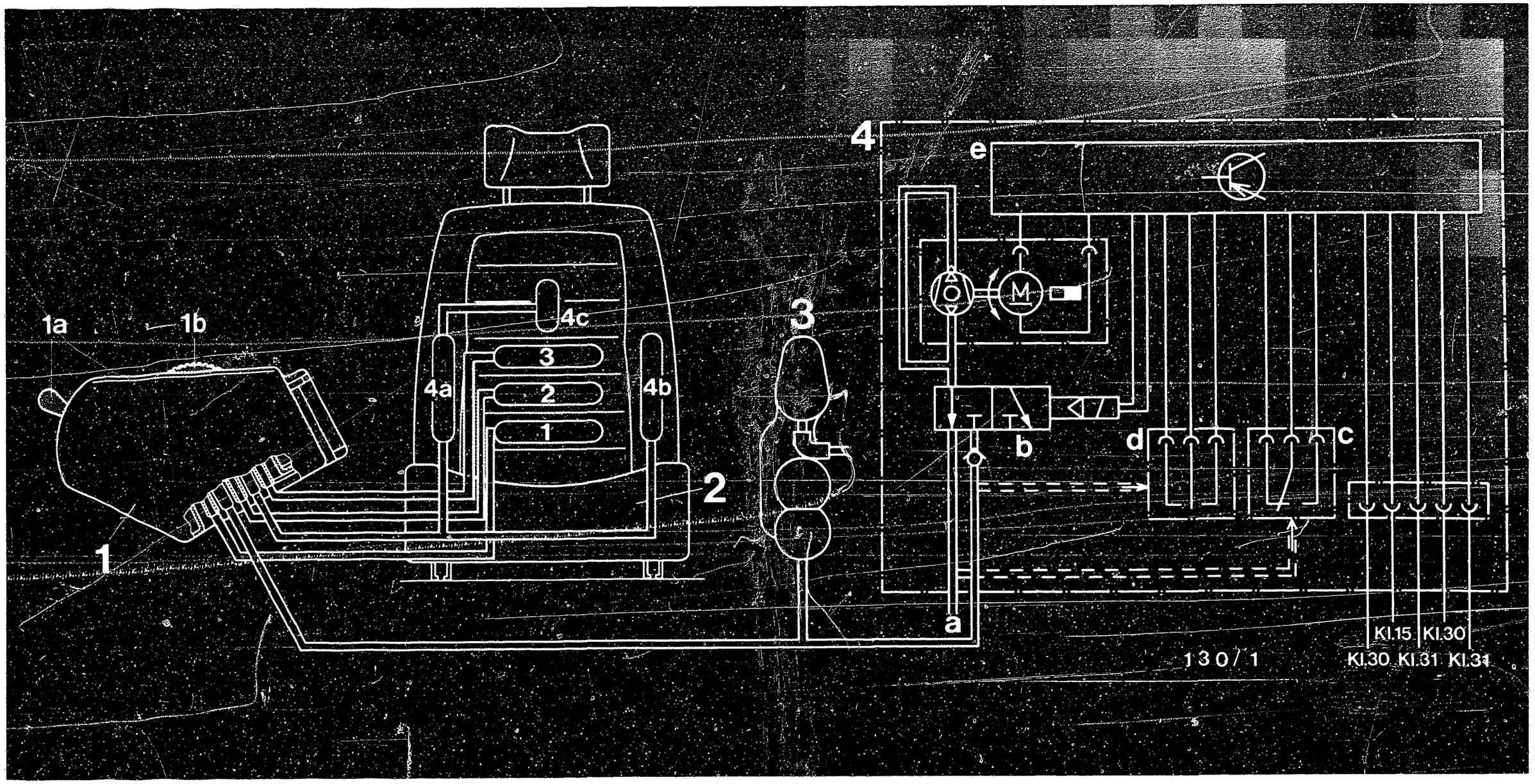


DIAGRAM OF LINES FOR ORTHOPAEDIC SEAT BACKREST

1 =Control valve
1a =Preselector for cushions 1 to 4
1b =Adjustment wheel for pressure adjustment (infinitely variable)
3 =Pressure reservoir
=Bi-pressure pump

a = to door lock (unlocking)
b = to door lock (locking)
c = Pressure-vacuum connection for centralized locking system
d = Change-over valve, centralized locking system/orthopaedic backrest

e = Pressure-vacuum switch, centralized lock. syst.
f = Pressure switch, orthopaedic backrest
g = Control electronics

TEST EQUIPMENT:

Vacuum tester e.g. ETT007.00 0684100700
or
Pressure-vacuum
tester e.g. ETT007.01 0684100701

Vacuum pump e.g. Mityvac
from Korinth, Ludwig-Kloos-Str.21
D-6450 Hanau 7 - Steinheim

Intermediate pieces for connection of
pressure-vacuum tester:

5 intermediate hoses User-fabrication

1 T-piece User-fabrication

GENERAL INFORMATION

The control valve of the orthopaedic seat backrest is mounted at the seat backrest.

The bi-pressure pump is installed in the trunk.

Note on service parts:

Pressure-vacuum lines, reservoirs and air cushions in the backrests are original MB service parts.

GENERAL INTRODUCTION:

The system consists of six air cushions installed in the backrest, one control valve, one compressed-air reservoir and one pressure-vacuum pump (bi-pressure pump).

Control valve:

The air cushions installed in the backrest can be selected via the preselector in the control valve through a range of 5 adjustment possibilities (A,B,C,D,E) (see table).

Preselector position	Cushion			
A	1			4
B	1	2		4
C		2		4
D		2	3	4
E			3	4

The inflation pressure may be controlled using the adjustment wheel. The control valve is supplied with pressure via the connection "p".

When the ignition is switched on, the bi-pressure pump is supplied with voltage via term. 15. The pump runs until a pressure of 0,59 bar has built up in the "orthopaedic seat backrest" system.

TESTING AND REPAIRING

Test requirements:

*Centralized locking system O.K.

*Vehicle electrical system voltage greater than 10 V

Notes:

With detailed testing and trouble-shooting, perform the test steps as of coordinate E15 one after the other.

TEST STEP 1 (TEST SPECIFICATIONS AND NOTES ON OPERATION)

V

Component/function:
Bi-pressure pump, pressure reservoir with emergency line/ pressure supply.

* Measuring equipment:
  Pressure-vacuum tester
  ETT 007.00
  ETT 007.01

* Measuring range:

* Connection:
  Connect control-valve hose-plug connection P with suitable T-piece to pres.-vacuum tester connection D.

* Operation in vehicle:
  Switch on ignition

* Test specification (reading):
  470...590 mbar

Bi-pressure pump running?
Is test specification within the test-specification tolerance?

N>

* Trouble-shooting

  For testing, disconnect plug from bi-pressure pump (upper ill.). Check voltage supply of bi-pressure pump. Check switch for centralized locking system in door lock.

+ Check for short circuit and break in lines to bi-pressure pump.

+ Check pressure supply line with pressure reservoir and control valve for leaks.

Y

V

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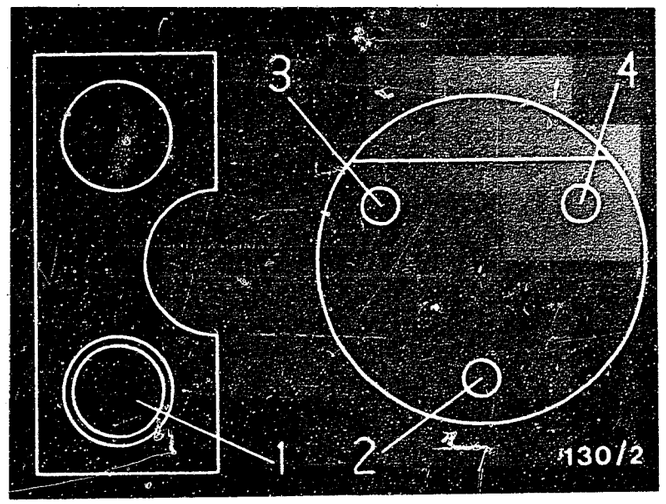
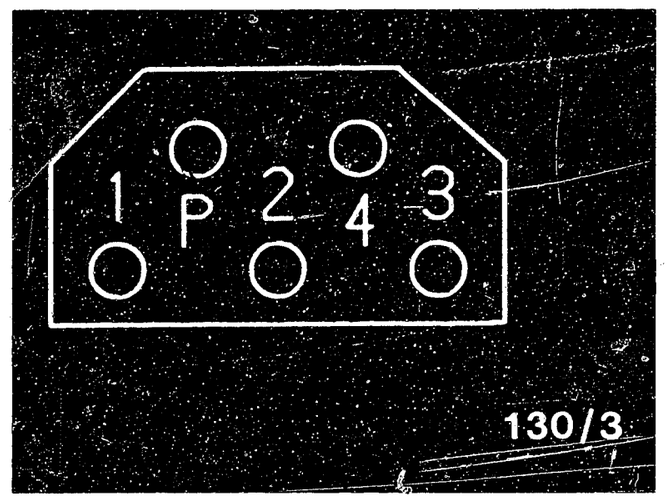


Plug assign., bi-press. pump:
1 = Voltage supply (term.15)
2 = Ground (term.31)
3,4= from door switch, centralized locking sys. (Kl.30)

Terminal assignment, hose-plug, rheostat-type switch



TEST STEP 2 (TEST SPECIFICATIONS AND NOTES ON OPERATION)

V

Component/Operation:
Control valve with air cushion 1

N>

* Measuring equipment:
Pressure-vacuum tester
ETT 007.00
ETT 007.01

* Measuring range:

* Connection:
Connect control-valve hose-plug connection 1 with suitable T-piece to pressure-vacuum tester connection D.

* Operation in vehicle:
Control valve in position A . Switch on ignition. Set 170...250 mbar at control valve using selection wheel.

* Test specifications (reading):
170...250 mbar
Permissible pressure drop smaller than 150 mbar/min

Is test specification reached?
Is pressure drop smaller than 150 mbar/min?

Y

V

Continued on next picture page

* Trouble-shooting:

+ Using hand pressure pump (e.g. Mityvac), check for leaks in pressure line from control valve to air cushion 1 :
Connect hand pressure pump to control-valve hose-plug connection.
Build up pressure of 1 mbar using hand pump.
Permissible pressure drop smaller than 200 mbar/min.

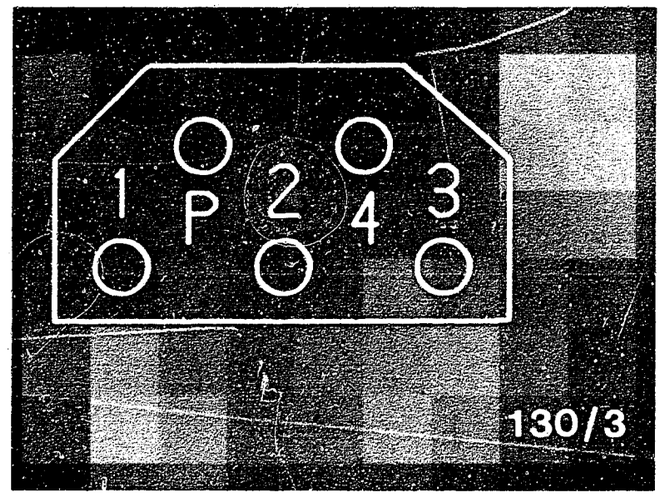
+ Check control valve for leaks.

* Fault elimination:

+ Replace pressure line from control valve to air cushion 100 .

+ Replace control valve.

+ Replace air cushion 1 in seat backrest (leather work).



Terminal assignment, hose-plug, rheostat-type switch

TEST STEP 3 (TEST SPECIFICATIONS AND NOTES ON OPERATION)

V

Component/Operation:
Control valve with air cushion 2 N>

* Measuring equipment:
Pressure-vacuum tester
ETT 007.00
ETT 007.01

* Measuring range:

* Connection:
Connect control-valve hose-plug connection 2 with suitable T-piece to pressure-vacuum tester connection D.

* Operation in vehicle:
Control valve in position 8 . Switch on ignition. Set 170...270 mbar at control valve using selection wheel.

* Test specifications (reading):
170...250 mbar
Permissible pressure drop smaller than 150 mbar/min

Is test specification reached?
Is pressure drop smaller than 150 mbar/min?

Y

V

Continued on next picture page

* Trouble-shooting:

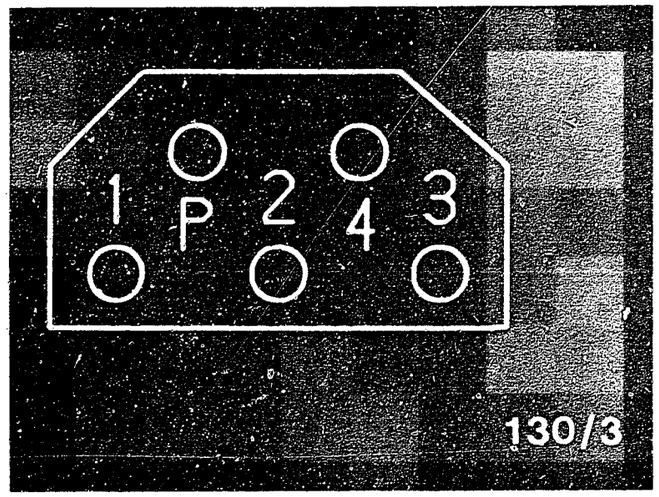
+ Using hand pressure pump (e.g. Mityvac), check for leaks in pressure line from control valve to air cushion 2 :
Connect hand pressure pump to control-valve hose-plug connection.
Build up pressure of 2 mbar using hand pump.
Permissible pressure drop smaller than 200 mbar/min.
+ Check control valve for leaks.

* Fault elimination:

+ Replace pressure line from control valve to air cushion 100 .

+ Replace control valve.

+ Replace air cushion 2 in seat backrest (leather work).



Terminal assignment, hose-plug, rheostat-type switch

TEST STEP 4 (TEST SPECIFICATIONS AND NOTES ON OPERATION)

V

Component/Operation:
Control valve with air cushion 3 N>

* Measuring equipment:
Pressure-vacuum tester
ETT 007.00
ETT 007.01

* Measuring range:

* Connection:
Connect control-valve hose-plug connection 3 with suitable T-piece to pressure-vacuum tester connection D.

* Operation in vehicle:
Control valve in position D . Switch on ignition. Set 170...250 mbar at control valve using selection wheel.

* Test specifications (reading):
170...250 mbar
Permissible pressure drop smaller than 150 mbar/min

Is test specification reached?
Is pressure drop smaller than 150 mbar/min?

Y

V

Continued on next picture page

* Trouble-shooting:

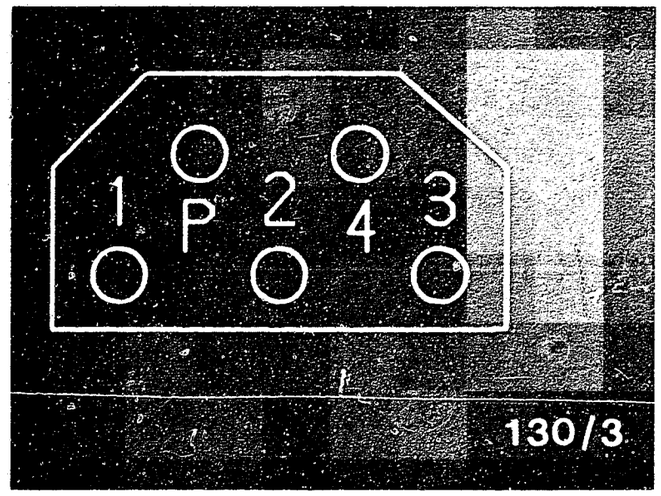
+ Using hand pressure pump (e.g. Mityvac), check for leaks in pressure line from control valve to air cushion 3 :
Connect hand pressure pump to control-valve hose-plug connection.
Build up pressure of 3 mbar using hand pump.
Permissible pressure drop smaller than 200 mbar/min.
+ Check control valve for leaks.

* Fault elimination:

+ Replace pressure line from control valve to air cushion 100 .

+ Replace control valve.

+ Replace air cushion 3 in seat backrest (leather work).



Terminal assignment, hose-plug, rheostat-type switch

TEST STEP 5 (TEST SPECIFICATIONS AND NOTES ON OPERATION)

Component/Operation:
Control valve with air cushion 4

N>

* Measuring equipment:
Pressure-vacuum tester
ETT 007.00
ETT 007.01

* Measuring range:

* Connection:
Connect control-valve hose-plug connection 4 with suitable T-piece to pressure-vacuum tester connection D.

* Operation in vehicle:
Control valve in position E . Switch on ignition. Set 170...250 mbar at control valve using selection wheel.

* Test specifications (reading):
170...250 mbar
Permissible pressure drop smaller than 150 mbar/min

Is test specification reached?
Is pressure drop smaller than 150 mbar/min?

* Trouble-shooting:

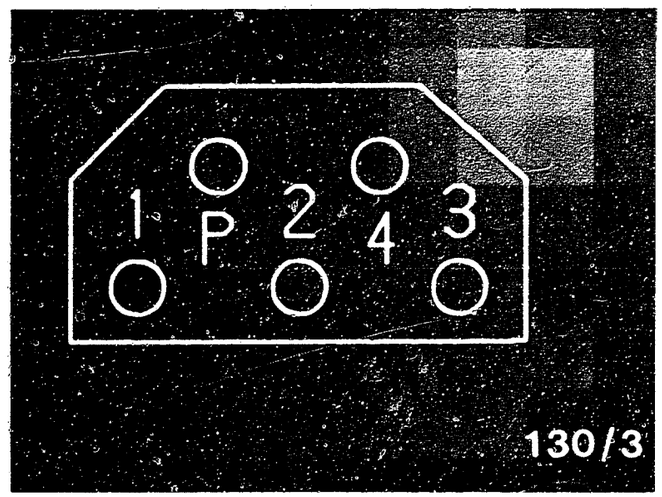
+ Using hand pressure pump (e.g. Mityvac), check for leaks in pressure line from control valve to air cushion 4 :
Connect hand pressure pump to control-valve hose-plug connection. Build up pressure of 4 mbar using hand pump.
Permissible pressure drop smaller than 200 mbar/min.
+ Check control valve for leaks.

* Fault elimination:

+ Replace pressure line from control valve to air cushion 100 .

+ Replace control valve.

+ Replace air cushion 4 in seat backrest (leather work).



Terminal assignment, hose-plug, rheostat-type switch

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB5003

BOSCH system : KE 3.1 - Jetronic

Make of vehicle : Mercedes Benz

Basic microcard : MB-525

Note:
Items without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* This microcard contains the trouble-shooting instructions, valid at the time of publication, for the following Mercedes-Benz model:

  230 E, TE, 2,31/4 Zyl.-Mot. (J/AUS) 08.85->

* Trouble-shooting with these instructions may only then take place when the details of the "Summary - Service Information for Vehicles" (KFZ-000) coincide with those of the vehicle type and with the BOSCH number of the KE-Jetronic control unit installed.

* Control unit using digital techniques, characteristic-map control using microprocessor.

* Electronically controlled low-idle-speed control with single-winding rotary actuator, without bypass adjusting screw.

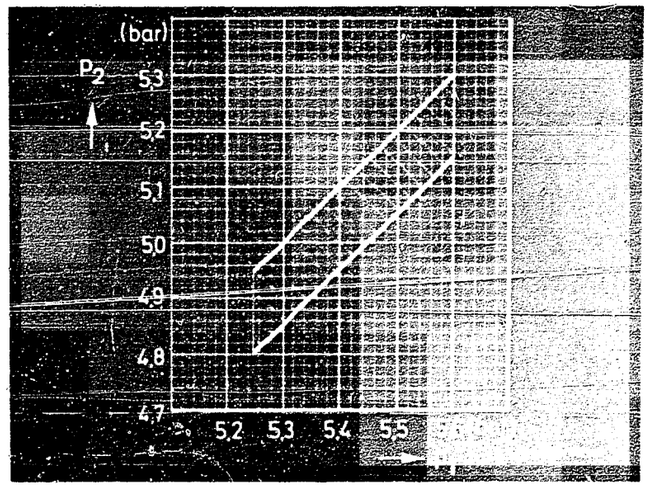
* Activated-carbon filter and regeneration valve for return of gasoline vapors into the intake manifold. (Fuel evaporation system)

Important note:

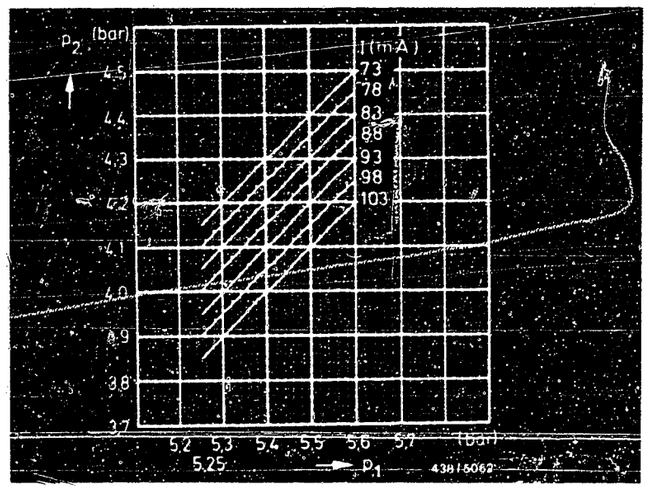
If reference is made to a basic microcard, always make sure you use the test specifications from the vehicle-specific brief instructions.

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	at least 1100 cm ^{3} /min	
2	Primary pressure:	5,25...5,6 bar	
3	Differential pressure: Suppression of peak coil current: actuate starting motor with fuel-pump relay disconnected. Do not switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0.15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 2,7 bar 2,6 bar	
5	Injection valves, opening pressure:	3,0...4,1 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA)	Setting point: (cm ^{3} /min)	Max. permis. delivery: (cm ^{3} /min)
	Idle: Part load: Full load:	6,0 40,0 100,0	6,6 42,5 109,0
	Min. delivery at max. air-flow sensor plate defl.:	140 cm ^{3} /min	



p_1 = Primary pressure
p_2 = Lower-chamber pressure

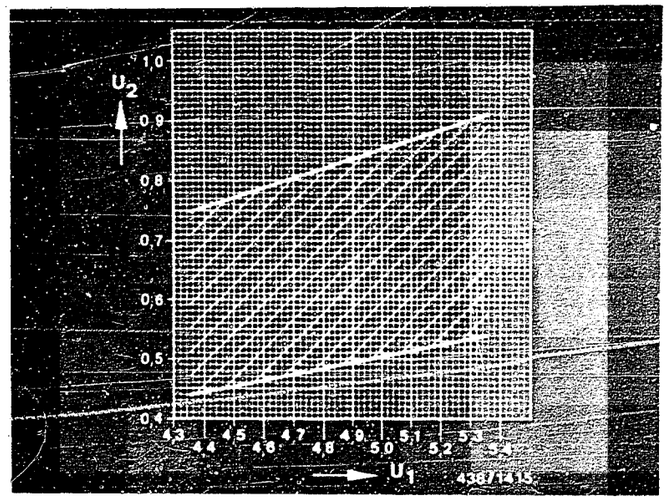


TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
7	Rate of flow, KE restriction:	130...150 cm^3 /min
8	Temperature sensor, air (NTC I): Air temperature +15...+30°C:	 —— k Ω
9	Temperature sensor, engine (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting: Fuel-distributor seat - needle bearing:	 20,9...21,6 mm
11	Idle adjustment: Low-idle-speed control: adjustment of idle-air delivery not possible. For testing, engine at norm. op. temp. Idle speed: Engage driving position, speed: Engage driving position and switch on air conditioner, speed: Check lambda closed-loop control: Measurement with lambda closed-loop control tester (e.g. KDJE-P 600) and adapter lead (e.g. KDJE-P 600/52) at diagn. socket outlet (pin3) Alternatively: Current measurement using universal test adapter. Put fuel evaporation system out of operation. On/off ratio fluctuating, mean value: Adjustment at idle-mixture-adjusting screw.	 700...800 min^{-1} 620...720 min^{-1} > 720 min^{-1} 45...55 %

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
12	Signal, air-flow sensor potentiometer: (Checking necessary when poor idle and/or part-load behavior) Measurement using test adapter and voltmeter. Determine supply voltage of potentiometer: Set value (test adapter, V-position 10): Determine potentiometer signal at idle speed. (Test adapter, V-position 11) Set value corresponding to supply voltage: Adjust signal if necessary at trimming potentiometer (at right next to potentiometer pins). Afterwards, re-secure adjusting screw of trimming potentiometer using black sealing compound (e.g Teroson).	 4,35...5,35 V See chart



U_1 = Supply voltage potentiometer

U_2 = Potentiometer voltage signal

p1 = Primary pressure

p2 = Lower-chamber pressure

SELF-DIAGNOSIS

All Daimler-Benz 4- and 6-cylinder engines in the current series (approx. 10.85) are equipped with self-diagnosis using on-off ratio measurement.

Incorrect input signals from the KE-Jetronic control unit can be displayed with the lambda closed-loop tester at the lambda test output (diagnosis socket, socket 3).

This provides information on short and open circuits. Defects which occur sporadically (e.g. loose contacts) are not indicated. Output of fault signals has priority over output of the lambda closed-loop signal.

We will not go into the defects which can be indicated in more detail here, since the input signals of the KE-Jetronic control unit can be tested with the universal test adapter (rapid-diagnosis chart).

However, if when testing the lambda closed-loop control by means of on-off ratio measurement, a constant on-off ratio is indicated, then the input signals of the KE-Jetronic control unit should be tested (rapid diagnosis chart).

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 WITH KE3 ADAPTER LEAD 1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the the KE-Jetronic, inlcuding the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

A t t e n t i o n :

When carrying out the test, make sure that the trimming plug is in position 1.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	V	4	–	Internal resistance (R_i) press. actu.	12–10	Disconnect control-unit plug.	20...30 Ω
2	V	5	–	Resistance NTC II (engine)	21– 2	Engine temperature +15...+30°C: approx. +80°C:	1,3...3,6 k Ω 250...390 Ω
3				Resistance NTC I (intake air)		Air temperature in area of NTC I = +15...+30°C:	Test step not applicable
4	V	6	–	Signal, altitude sensor	11– 2	Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	 3,2...4,5 V 2,8...4,0 V 2,4...3,5 V 2,0...3,0 V 1,6...2,5 V 0,8...1,6 V
5	V	9	–	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	 0...10 Ω > 1000 Ω
6	V	10	–	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	infinite Ω 0...10 Ω
7	V	11	–	Microswitch idle linkage	24– 2	Throttle valve closed: open:	0...10 Ω infinite Ω
8	V	12	–	Ground, control unit	20– 2		0...10 Ω
9	V	13	–	Ground, pin 7	7– 2	Switch off ignition. Connect control unit.	0...10 Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
10	| V	14	–	Trimming plug mixture map	22– 2	Disconnect control-unit plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) to engine ground. Trimming-plug position 1: 2: 3: 4: 5: 6: 7:	 0...10 Ω —— Ω —— Ω —— Ω —— Ω —— Ω —— Ω
11	| V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer. Selection lever position P,N: Driving position selected:	 0...10 Ω infinite Ω
12	5	–	–	TD signal	25– 2	Start engine (starting motor):	Voltage undefined
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	8...15 V
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	8...15 V
16	9	–	–	Air-conditioner cut-in signal	19– 2	Switch off ignition. Connect control unit. Start engine, switch on air conditioner. Temperature regulator = minimum temperature	 8...15 V
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,35 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
18	11	–	–	Signal, air-flow sensor potentiometer	17– 2	Switch on ignition. Air-flow sensor plate in neutral position: Defect air-flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V
19	13	–	1	Temperature signal form control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage indefined Voltage change
21	–	–	–	Peak coil current	12–12	Switch on ignition:	->FD ——: ——— mA FD 546 ->: 90...110 mA
22	–	–	1	Warm-up enrichment + 20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	->FD ——: ——— mA FD 546 ->: 5...8 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Engine at norm. op. temp., idle. Current value with btn 2 pressed; reading oscillating, mean value:	->FD ——: ——— mA FD 546 ->: –1...+1 mA
24	–	21	1	Starting enrichment	12–12	So that engine fails to start: Disconnect speed relay for electric fuel pump. Short circuit ignition coil term. 4 to ground via resistance of at least 2 k Ω . (e.g. with sleeve-type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 sec.) to:	->FD ——: ——— mA FD 546 ->: 55...75 mA

*) FD = Date of manufacture

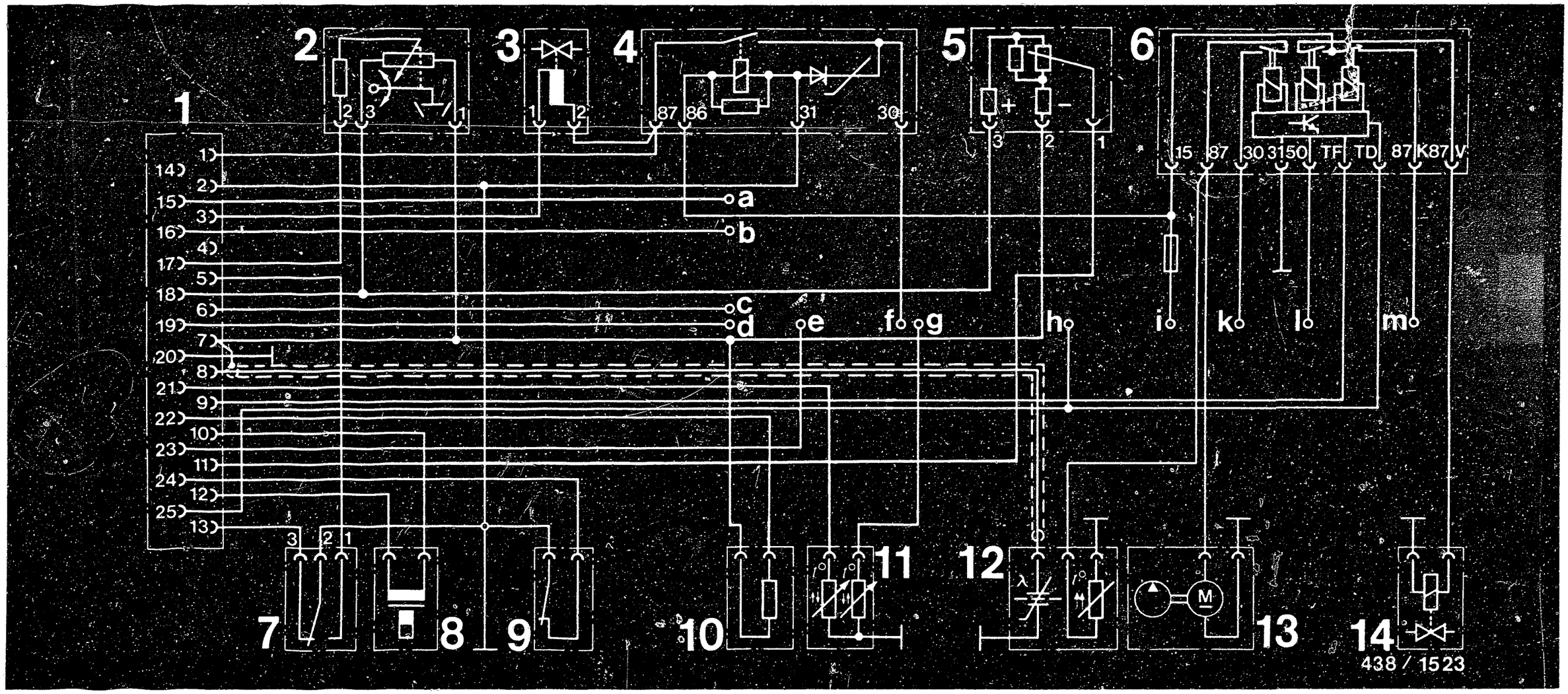
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
25	–	21	1	Post-start enrichment	12-12	Start engine (at normal operating temperature) while actuating btn 1. Current value: Current value constant for approx: Then slow speed regulation to:	 ->FD ——: ——— mA FD 546 ->: 14...18 mA ->FD ——: ——— s FD 546 ->: 2...7 s ->FD ——: ——— mA FD 546 ->: 5...8 mA
26	–	21	1	Acceleration enrichment	12-12	Engine at normal operating temperature, idle. While actuating btn 1, perform snap acceleration of engine. Thus current rise (approx. 1 s) to: Note: Level of current value dependent upon intensity of acceleration (travel/duration of air-flow sensor flap movement).	 ->FD ——: ——— mA FD 546 ->: 45..65 mA
27	–	–	–	Overrun cut-off	12-12	Re-connect ammeter (swap positive and negative) Start engine (normal operating temperature). Speed n to approx.: Hold there. Manually actuate idle throttle-valve switch (for 4- and 6-cyl. engines, microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:	 ->FD 551: 3200 min $^{-1}$ FD 552 ->: 2000 min $^{-1}$ -40...-80 mA

*) FD = Date of manufacture

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specification CAT
28	–	24	–	Full-load enrichment	12-12	Engine at normal operating temperature, idle. Reading oscillating, mean value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: A t t e n t i o n: Do this very briefly, so that speed does not rise too much and engine is not damaged.	 ->FD ——: ——— mA FD 546 ->: –1...+1 mA ->FD ——: ——— mA FD 546 ->: 4...7 mA
29	–	21	–	Lambda closed-loop control, open-loop control mode	12-12	Disconnect regeneration lead to throttle-valve assembly at generation valve and seal. Engine at norm. op. temp., idle. Current value:	 –1...+1 mA
30	–	24	–	Lambda closed-loop control, closed-loop control mode	12-12	Engine at norm. op. temp., idle. Closed-loop control mode can be recognized from the oscillating current reading. Mean value: If mean value outside tolerance, set (idle-mixture-adjusting screw) to approx.:	 –1...+1 mA 0 mA
31	–	22	–	Lambda closed-loop control, rich stop	12-12	Engine at norm. op. temp., idle. Current rise to:	8...12 mA
32	–	23	–	Lambda closed-loop control, lean stop	12-12	Engine at norm. op. temp., idle. Current drop to:	–8...–12 mA

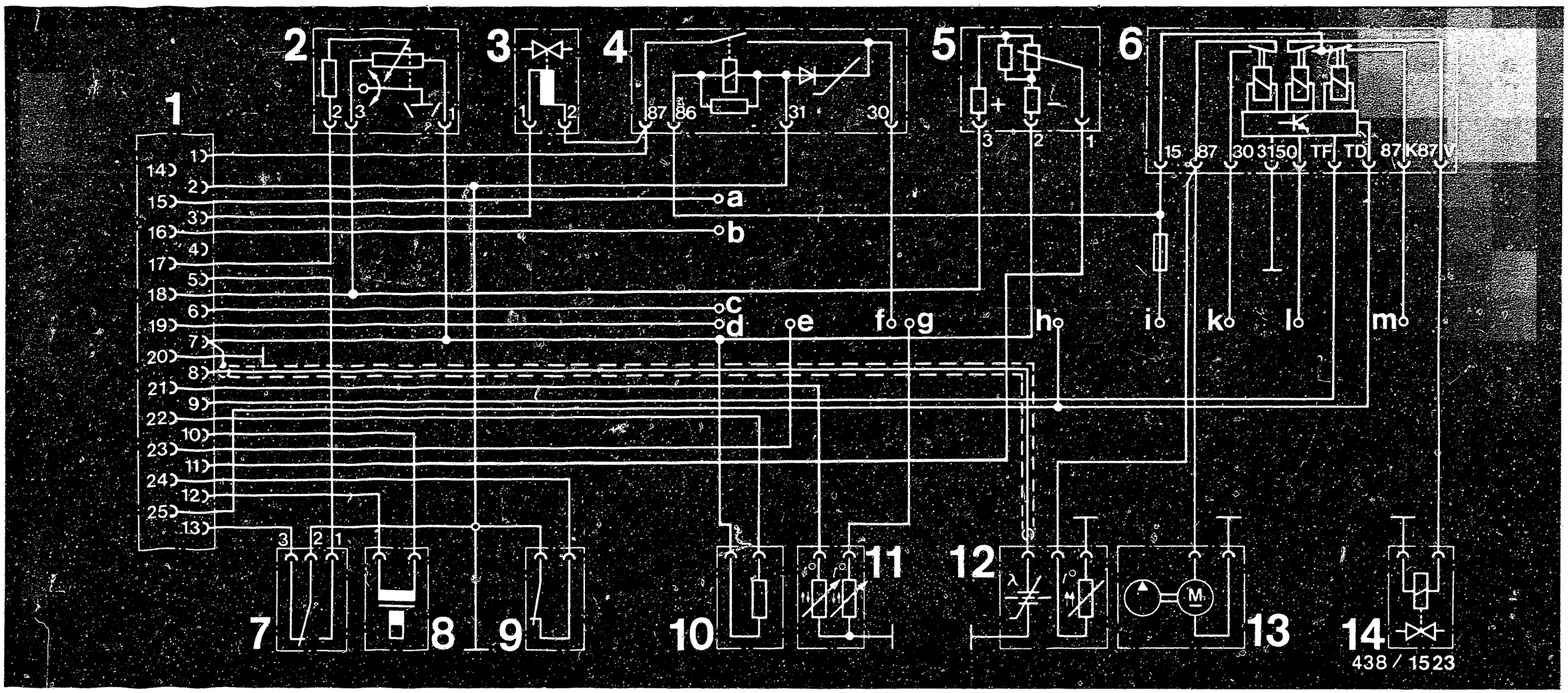
*) FD = Date of manufacture



1 = Control unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Idle actuator
4 = Over-voltage protection relay
5 = Altitude sensor
6 = Electronic relay for electric fuel pump and cold-start valve actuation
7 = Throttle-valve switch, idle/full load
8 = Electro-hydraulic pressure actuator
9 = Throttle-valve switch, idle/linkage
10 = Trimmer resistor, mixture map
11 = Temperature sensor, engine (Double NTC)
12 = Heated lambda sensor
13 = Electric fuel pump
14 = Cold-start valve

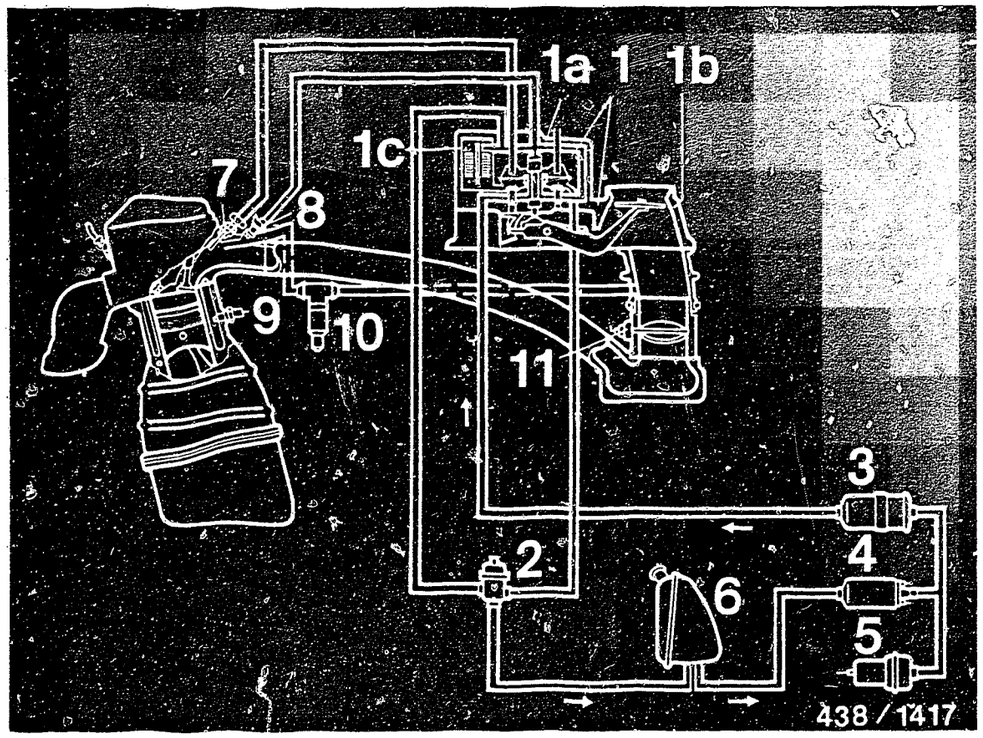
ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

F21 ⟹
F22 ⟺



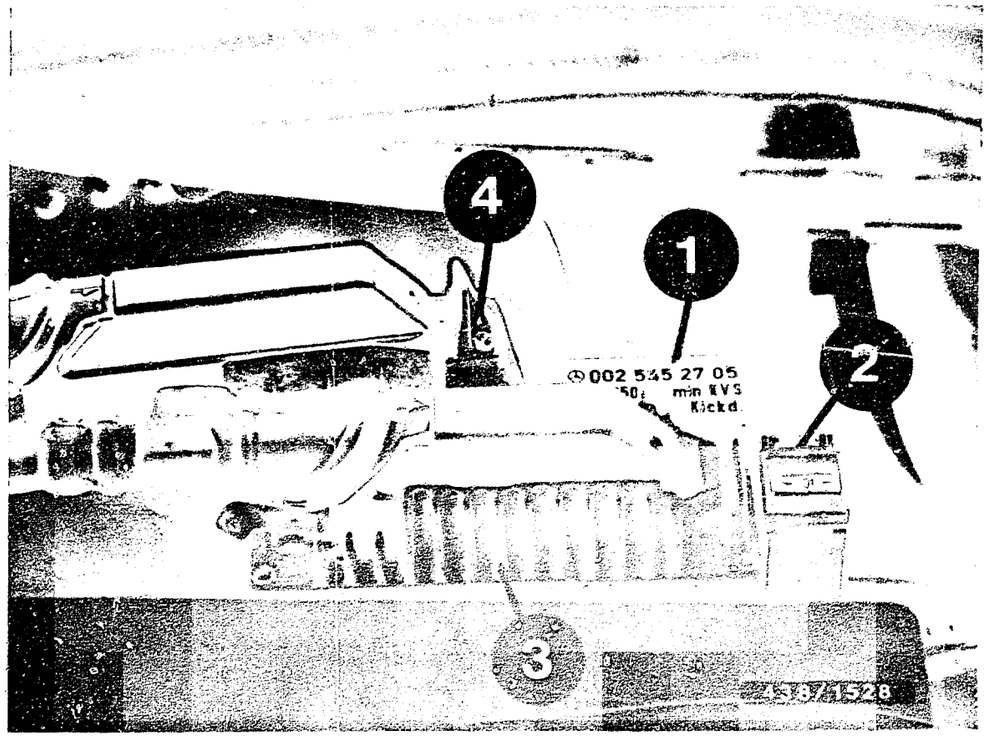
a = Lambda malfunction indicator
b = Transmission switch
c = Connection, Tempomat operating element
d = Connection, air-conditioner control unit
e = Lambda test output (diagnosis socket outlet, socket 3)
f = Terminal 30
g = Ignition system (EI)
h = Terminal TD, ignition
i = Terminal 15
k = Terminal 30
l = Terminal 50
m = Kick-down switch, socket 1

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT (CONTINUATION)



1 = Mixture-control unit
1a = Fuel distributor
1b = Air-flow sensor
1c = Electro-hydraulic pressure actuator
2 = Pressure regulator, primary pressure
3 = Fuel filter
4 = Electric fuel pump
5 = Fuel accumulator
6 = Fuel tank
7 = Injection valve
8 = Cold-start valve
9 = Temperature sensor engine (Double NTC)
10 = Idle actuator
11 = Throttle-valve switch, idle/full load

DIAGRAM OF AIR AND FUEL LINES



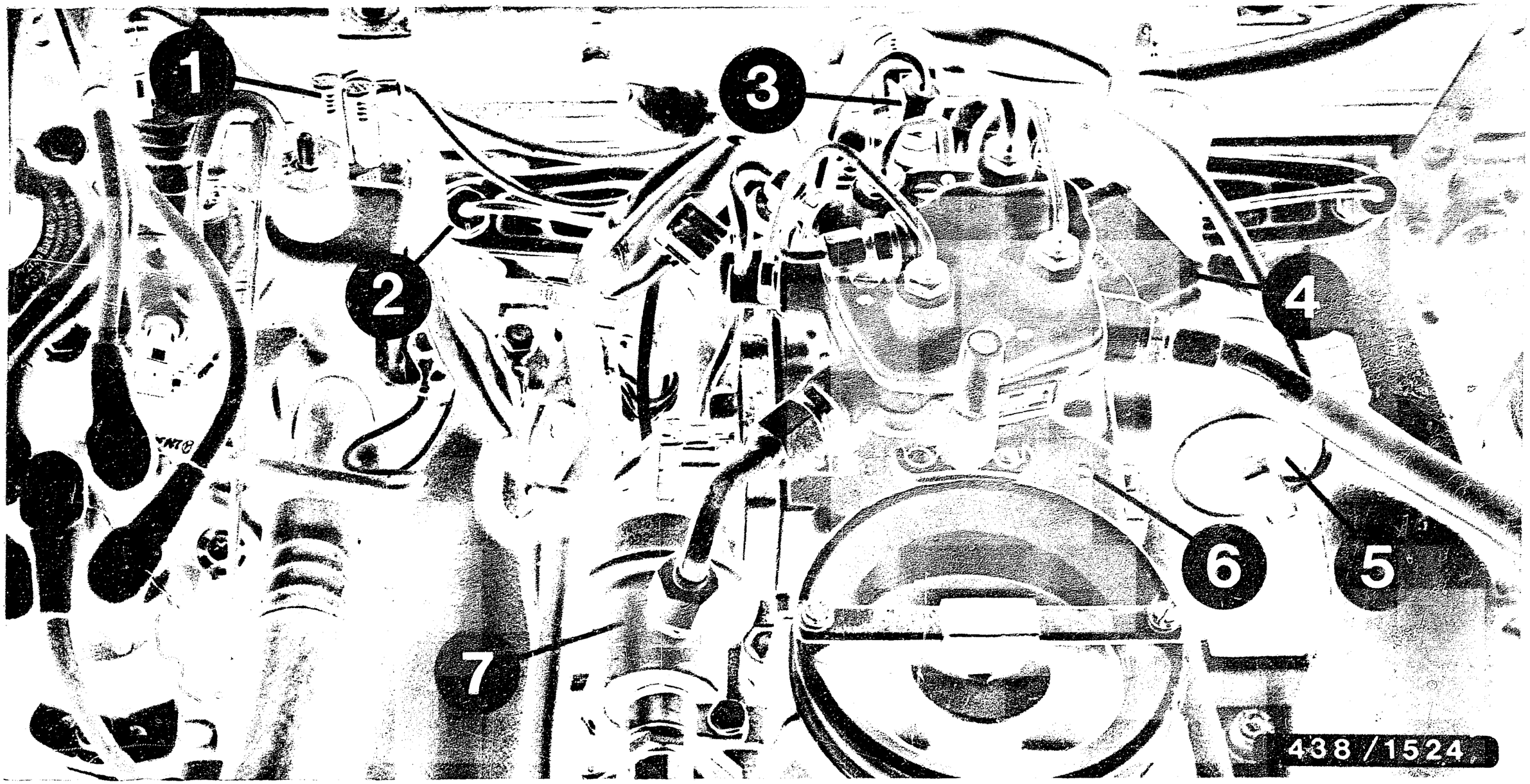
1 = Electronic relay for electric fuel pump and cold-start valve actuation

2 = Over-voltage protection relay

3 = KE-Jetronic control unit

4 = ABS controller (if present)

INSTALLATION POSITION OF COMPONENTS



1 = Engine temperature sensor
2 = Injection valves
3 = Cold-start valve
4 = Pressure actuator
5 = Idle actuator
6 = Mixture-control unit
7 = Pressure regulator

INSTALLATION POSITION OF COMPONENTS

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5004

BOSCH system : KE 3.1 - Jetronic

Make of vehicle : Mercedes-Benz

Basic microcard : PKW-014

Note:
Items without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* These instructions contain the trouble-shooting instructions, valid at the time of publication, for the following model:

  MERCEDES-BENZ
  190E, 2,01/4-Zyl.-Mot. 07.85->

* Trouble-shooting with theses instructions may only then take place when the details of the "Summary - Service Information for Vehicles" (KFZ-0..) coincide with those of the vehicle type and with the BOSCH number of the KE-Jetronic control unit installed.

* Control unit using digital techniques, characteristic-map control using microprocessor.

* Multi-functional fuel-management system with a characteristic map for operation with lambda closed-loop control (CAT) and a characteristic map for operation without lambda closed-loop control (ECE). Activation of the characteristic maps by trimming plug with corresponding marking. To set to the fuel grades unleaded regular and unleaded premium, only the ignition trimming plug must be re-connected.

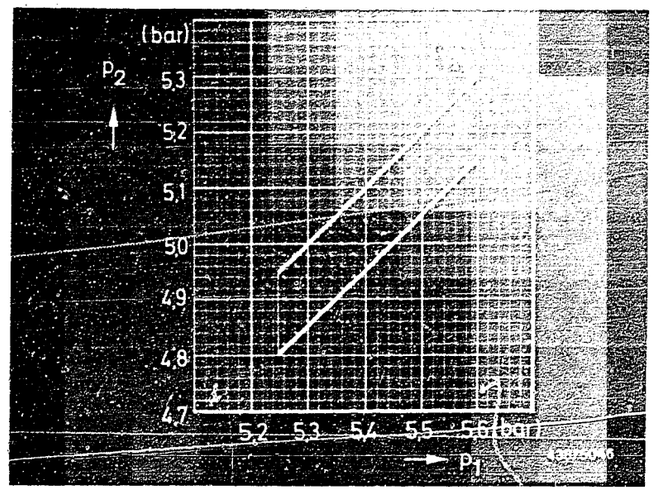
* Electronically controlled idle-speed control with single-winding rotary actuator, without bypass adjusting screw.

* Activated-carbon filter and regeneration valve for return of gasoline vapors into the intake manifold. (Fuel evaporation system)

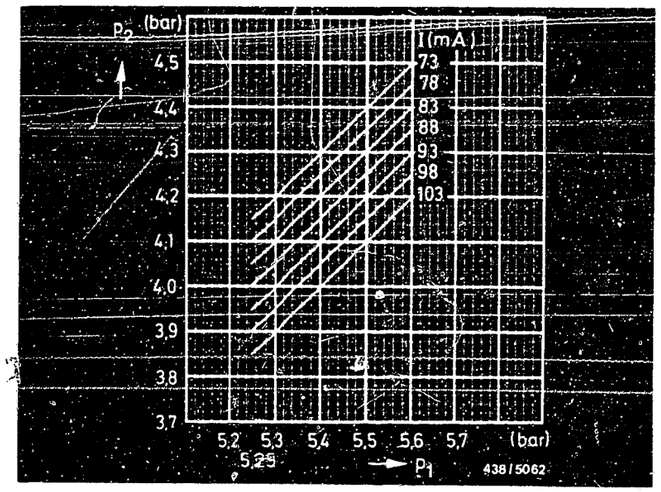
Important note:
If reference is made to a basic microcard, always make certain you use the test specifications from the vehicle-specific brief instructions.

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	at least 1000 cm ^{3} /min	
2	Primary pressure:	5,25...5,6 bar	
3	Differential pressure: Suppression of peak coil current: actuate starting motor with fuel-pump relay disconnected. Do <u>not</u> switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0.15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 2,7 bar 2,6 bar	
5	Injection valves, opening pressure:	3,0...4,1 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA) Idle: Part load: Full load: Min. delivery at max. air-flow sensor plate defl.:	Setting point: (cm ^{3} /min) 6,0 40,0 100,0 140 cm ^{3} /min	Max. permis. delivery: (cm ^{3} /min) 6,6 42,5 109,0



p_1 = Primary pressure
p_2 = Lower-chamber pressure

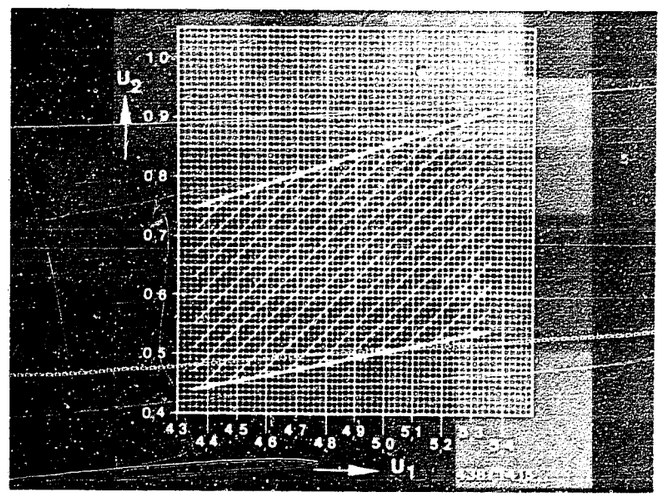


TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
7	Rate of flow, KE restriction:	130...150 cm^3 /min
8	Temperature sensor, air (NTC I): Air temperature +15...+30°C:	 1,3...3,6 k Ω
9	Temperature sensor, engine (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting: Fuel-distributor seat - needle bearing:	 20,9...21,6 mm
11	Idle adjustment: Low-idle-speed control: adjustment of idle-air delivery not possible. For testing, engine at norm. op. temp. Idle speed: Engage driving position, speed: Engage driving position and switch on air conditioner, speed: Only ECE: CO concentration in exhaust gas: Only CAT: Check lambda closed-loop control: Measurement with lambda closed-loop control tester (e.g. KDJE-P 600) and adapter lead (e.g. KDJE-P 600/52) at diag. socket outlet (pin3). Alternatively: Current measurement using universal test adapter. Put fuel evaporation system out of operation. On-off ratio fluctuating, mean value: Adjustment at idle-mixture-adjusting screw.	 700...800 min^{-1} 620...720 min^{-1} > 720 min^{-1} 0,5...1,5 % CO by vol. 40...60 %

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
12	Signal, air-flow sensor potentiometer: (Checking necessary when poor idle and/or part-load behavior) Measurement using test adapter and voltmeter. Determine supply voltage of potentiometer: Set value (test adapter, V-position 10): Determine potentiometer signal at idle speed. (Test adapter, V-position 11) Set value corresponding to supply voltage: Adjust signal if necessary at trimming potentiometer (at right next to potentiometer pins). Afterwards, re-secure adjusting screw of trimming potentiometer using black sealing compound (e.g Teroson).	 4,35...5,35 V See chart



U_1 = Supply voltage potentiometer

U_2 = Potentiometer voltage signal

p1 = Primary pressure

p2 = Lower-chamber pressure

SELF-DIAGNOSIS

All Daimler-Benz 4- and 6-cylinder engines in the current series (approx. 10.85) are equipped with self-diagnosis using on-off ratio measurement.

Incorrect input signals from the KE-Jetronic control unit can be displayed with the lambda closed-loop tester at the lambda test output (diagnosis socket, socket 3).

This provides information on short and open circuits. Defects which occur sporadically (e.g. loose contacts) are not indicated. Output of fault signals has priority over output of the lambda closed-loop signal.

We will not go into the defects which can be indicated in more detail here, since the input signals of the KE-Jetronic control unit can be tested with the universal test adapter (rapid-diagnosis chart).

However, if when testing the lambda closed-loop control by means of on-off ratio measurement, a constant on-off ratio is indicated, then the input signals of the KE-Jetronic control unit should be tested (rapid diagnosis chart).

RAPID DIAGNOSIS CHART TO UNIVERSAL TEST ADAPTER ETT 018.01 WITH KE3 ADAPTER LEAD 1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the KE-Jetronic, including the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

The "Test specifications" column contains the test specifications for both the version without lambda closed-loop control (ECE, left-hand test-specifications column) and for the version with lambda closed-loop control (CAT, right-hand test-specifications column). Before starting testing, determine which version is being tested. If only one test specification is given, this applies to both versions.

Attention: When carrying out the test, make sure that the trimming plug is in position 1.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	V	4	–	Int. resistance(R_i) pressure actuator	12–10	Disconnect control-unit lead plug.	20...30 Ω
2	V	5	–	Resistor NTC II (engine)	21– 2	Engine temperature +15°...+30° C: approx. +80° C :	1,3...3,6 k Ω 250...390 Ω
3	V	6	–	Resistor NTC I (intake air)	11– 2	Air temperature in area of NTC I: +15°...+30° C:	1,3...3,6 k Ω
4				Signal, altitude sensor		Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	Test step not applicable!
5	V	9	–	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	0...10 Ω > 1000 Ω
6	V	10	–	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	infinite Ω 0...10 Ω
7	V	11	–	Microswitch idle linkage	24– 2	Throttle valve closed: open:	0...10 Ω infinite Ω
8	V	12	–	Ground, control unit	20– 2		0...10 Ω
9	V	13	–	Ground, pin 7	7– 2	Switch off ignition. Connect control unit.	0...10 Ω

RAPID DAIGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
10	⎍ V	14	–	Trimming plug mixture map	22– 2	Disconnect control-unit lead plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) with engine ground. Trimming-plug position 1: 2: 3: 4: 5: 6: 7:	 50... 60 Ω 100...120 Ω 150...190 Ω 230...270 Ω 330...370 Ω 430...470 Ω 570...620 Ω	 900...1050 Ω 1200...1350 Ω 1500...1750 Ω 2000...2400 Ω 3000...3600 Ω 5000...5600 Ω 11000..12000 Ω
11	⎍ V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer. Selection lever in position P, N: Driving position selected:	 0...10 Ω Infinite Ω	
12	5	–	–	TD signal	25– 2	Start engine (starting motor):	Voltage indefined	
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V	
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	8...15 V	
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	8...15 V	
16	9	–	–	Air-conditioner cut-in signal	19– 2	Connect control unit. Start engine, switch on air conditioner. Temperature regulator = minimum temperature:	 8...15 V	
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,35 V	

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specificatons ECE	CAT
18	11	–	–	Signal, air–flow sensor potentiometer	17– 2	Switch on ignition. Air–flow sensor plate in neutral position: Deflect air–flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V	
19	13	–	1	Temperature signal from control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V	
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage indefined Voltage change	
21	–	–	–	Peak coil current	12–12	Switch on ignition:	->FD 547 : 90...110 mA FD 548–>: 9... 11 mA	->FD 547 : 90...110 mA FD 548–>: 18... 22 mA
22	–	–	1	Warm–up enrichment +20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	->FD —— : ——— mA FD 547–>: 12... 16 mA	->FD 547 : 12... 16 mA FD 548–>: 9... 11 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Eng. at norm. op. temp., idle Current valve with btn 2 pressed: With CAT, oscillating, mean value:	->FD —— : ——— mA FD 547–>: –4...+7 mA	->FD —— : ——— mA FD 547–>: –1...+1 mA
24	–	21	1	Starting enrichment	12–12	So that eng. fails to start: Disconnect speed relay for elec. fuel pump. Short circuit ign. coil term.4 to grnd via resist. of at least 2k Ω (E.g. with sleeve–type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 s.) to:	->FD —— : ——— mA FD 547–>: 65...85 mA	->FD 547 : 65...85 mA FD 548–>: 60...80 mA

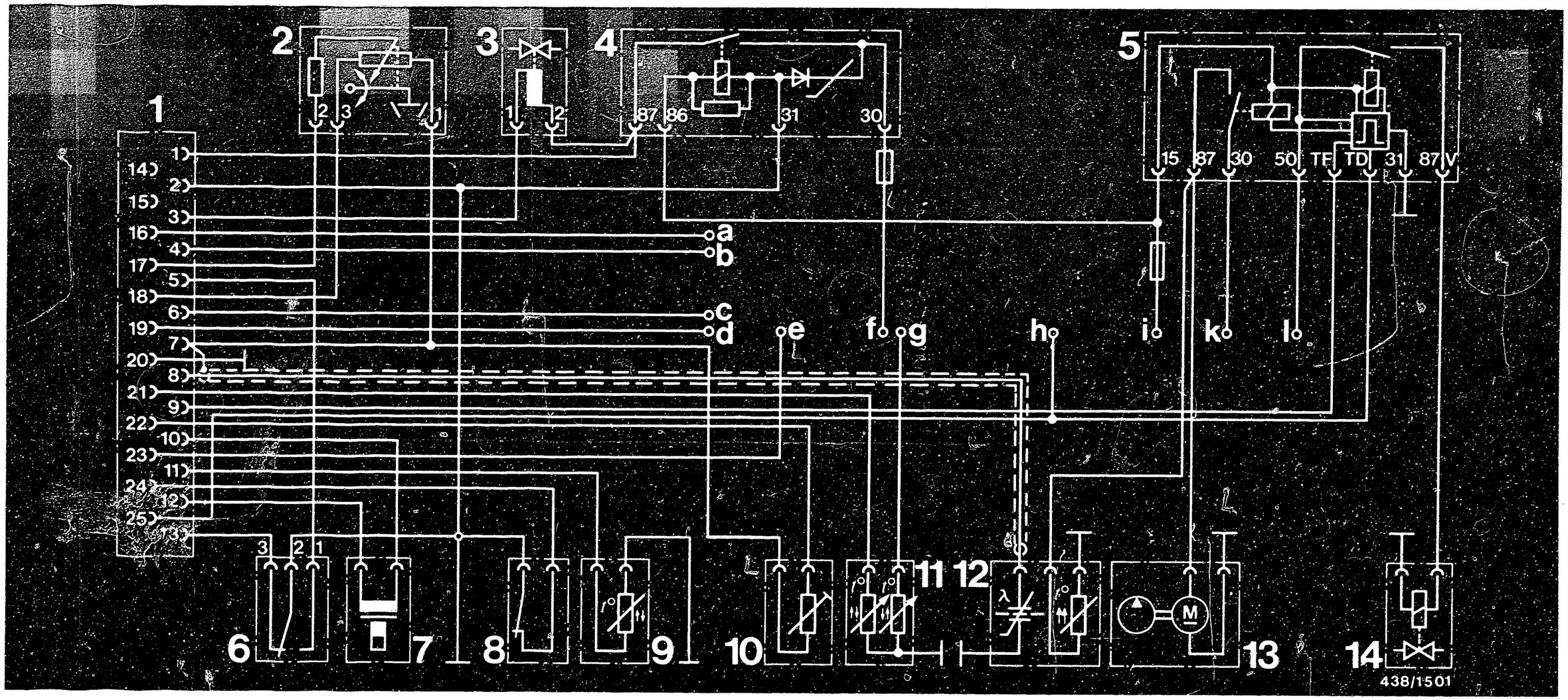
FD = Date of manufacture

No.	Switch/Btn V	Switch/Btn Ω	Switch/Btn Btn	Under test	Test pins	Test conditions	Test specifications ECE	Test specifications CAT
25	–	21	1	Post-start enrichment	12–12	Start engine (at normal op. temp.) while actuating btn 1. Current value: Current value const. for app. Then slow speed reg. to:	 –>FD —— : ——— mA FD 547–>: 23...29 mA –>FD —— : ——— s FD 547–>: 4...10 s –>FD —— : ——— mA FD 547–>: 12...16 mA	 –>FD 547 : 23...29 mA FD 548–>: 18...23 mA –>FD —— : ——— s FD 547–>: 4...10 s –>FD 547 : 12...16 mA FD 548–>: 9...11 mA
26	–	21	1	Acceleration enrichment	12–12	Eng. at norm. op. temp., idle While actuating btn 1, perform snap acceleration of eng Thus current rise (approx. 1 s) to: <u>Note:</u> Level of current value dependent upon intensity of acceleration (travel/ duration of air-flow sensor plate movement).	 –>FD —— : ——— mA FD 547–>: 60...80 mA	 –>FD —— : ——— mA FD 547–>: 50...70 mA
27	–	–	–	Overrun cut-off	12–12	Re-connect ohmmeter (swap positive and negative). Start eng. (norm. op. temp.). Speed n to approx.: Hold there. Manually actuate idle throttle-valve switch (for 4- and 6- cyl. eng. microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:	 –>FD —— : ——— min^{-1} FD 547–>: 1900 min^{-1} –40...–80 mA	 –>FD —— : ——— min^{-1} FD 547–>: 1900 min^{-1} –40...–80 mA

FD = Date of manufacture

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
28	–	24	–	Full-load enrichment	12-12	Eng. at norm. op. temp., idle Current value (ECE): With CAT, oscil., mean value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: Attention: Do this very briefly, so that speed does not rise too much and engine is not damaged.	–>FD —— : ——— mA FD 547–>: –4...+7 mA –>FD —— : ——— mA FD 547–>: 2...6 mA	–>FD —— : ——— mA FD 547–>: –1...+1 mA –>FD —— : ——— mA FD 547–>: 2...6 mA
29	⏦	21	–	Lambda closed-loop control, open-loop control mode	12-12	Disconnect regeneration lead to throttle-valve assembly at regeneration valve and seal. Eng. at norm. op. temp., idle Current value:	——	–1...+1 mA
30	–	24	–	Lambda closed-loop control, closed-loop control mode	12-12	Eng. at norm. op. temp., idle Closed-loop control mode can be recognized from the oscillating current reading. Mean value: If mean value outside tolerance, set (idle-mixture-adjusting screw) to:	—— ——	–1...+1 mA approx. 0 mA
31	–	22	–	Lambda closed-loop control, rich stop	12-12	Eng. at norm. op. temp., idle Current rise to:	——	8...12 mA
32	–	23	–	Lambda closed-loop control, lean stop	12-12	Eng. at norm. op. temp., idle Current drop to:	——	–8...–12 mA

FD = Date of manufacture

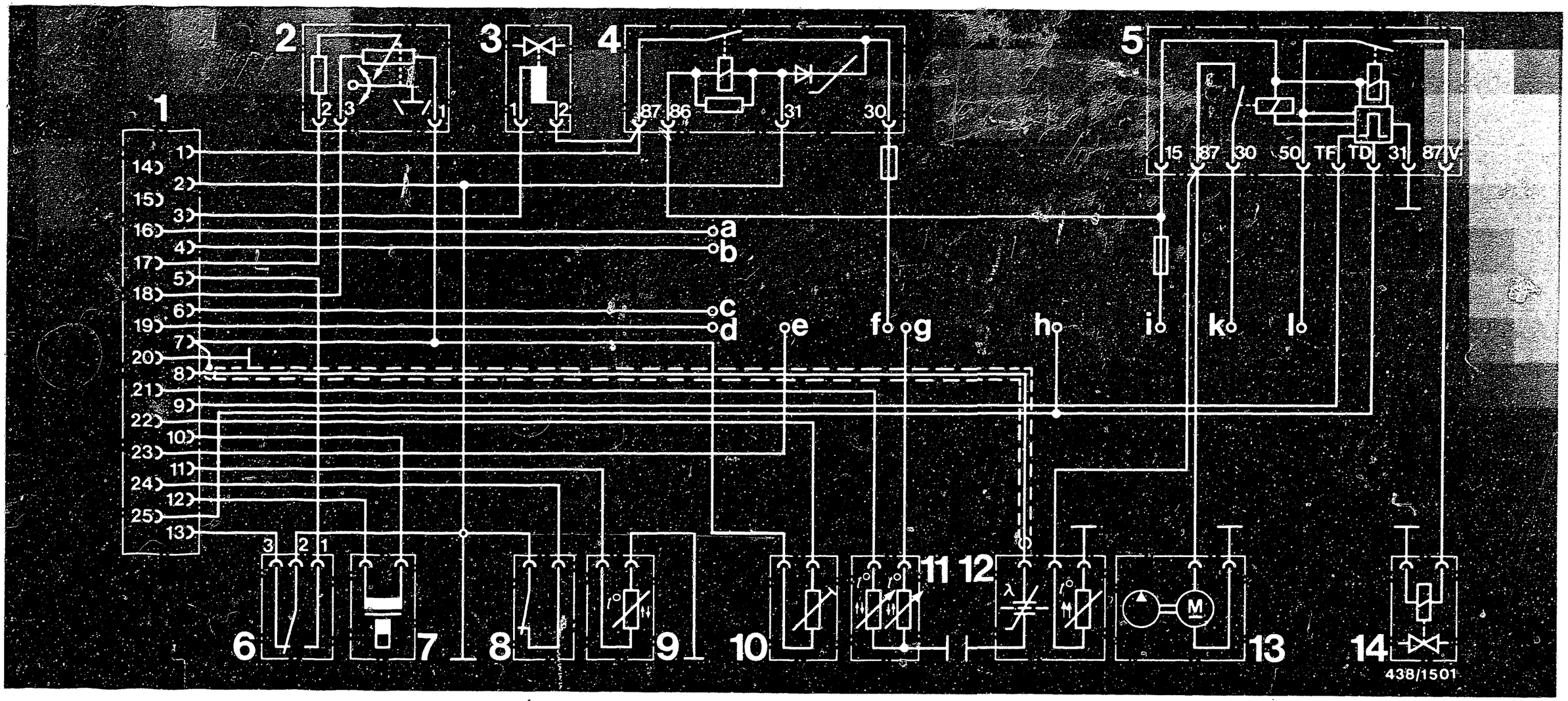


1 = Control-unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Idle actuator
4 = Over-voltage protection relay
5 = Electronic relay for electric fuel pump and cold-start valve actuation
6 = Throttle-valve switch, idle/full load
7 = Electro-hydraulic pressure actuator
8 = Throttle-valve switch, idle/linkage
9 = Temperature sensor, intake air (NTC I)
10 = Trimming plug, map adjustment
11 = Temperature sensor, engine (Double NTC)
12 = Heated lambda sensor
13 = Electric fuel pump
14 = Cold-start valve

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

G21 —⟹

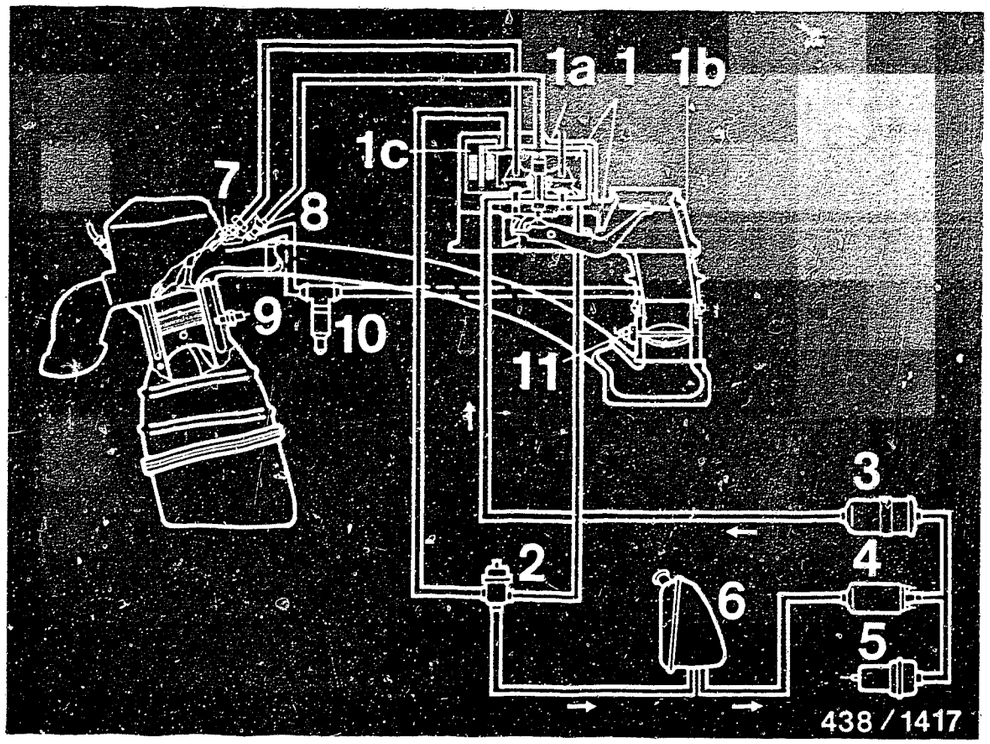
G22 ⟸—⟹



a = Transmission switch (only Automatic)
b = Consumption signal
c = Connection of Tempomat operating element
d = Connection of air-conditioner control unit
e = Lambda test output

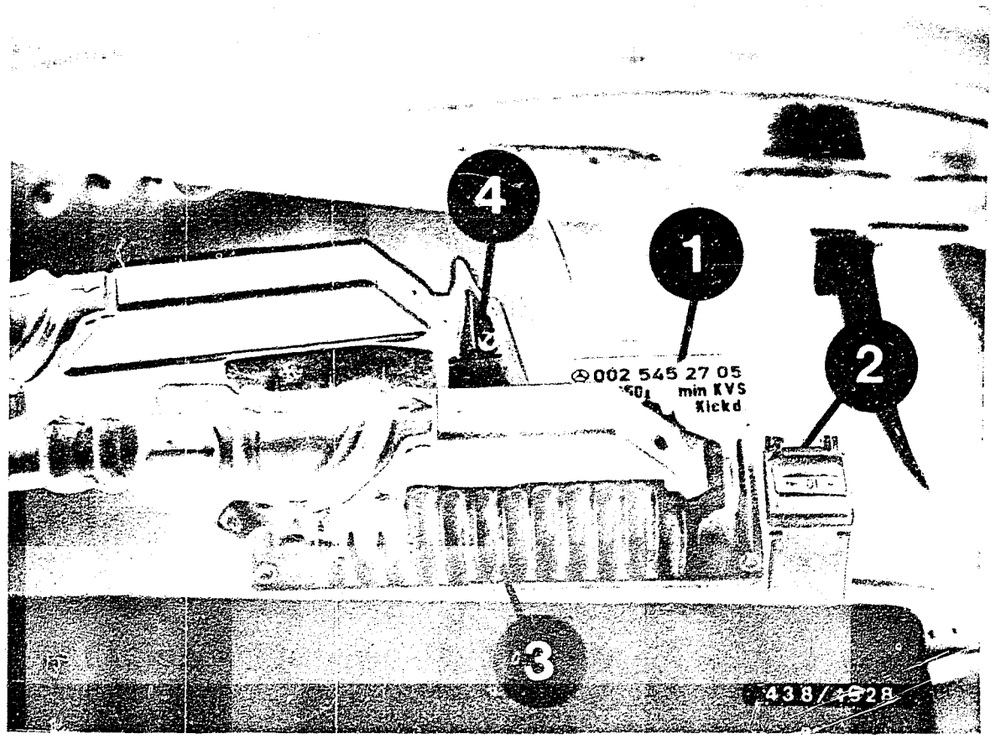
f = Terminal 30 (B +)
g = Ignition system (EI-L)
h = TD signal, ignition
i = Terminal 15
k = Terminal 30 (B +)
l = Terminal 15a - starting motor

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT (CONTINUED)



1 = Mixture-control unit
1a = Fuel distributor
1b = Air-flow sensor
1c = Electro-hydraulic pressure actuator
2 = Pressure regulator, primary pressure
3 = Fuel filter
4 = Electric fuel pump
5 = Fuel accumulator
6 = Fuel tank
7 = Injection valve
8 = Cold-start valve
9 = Temperature sensor engine (Double NTC)
10 = Idle actuator
11 = Throttle-valve switch, idle/full load

DIAGRAM OF AIR AND FUEL LINES



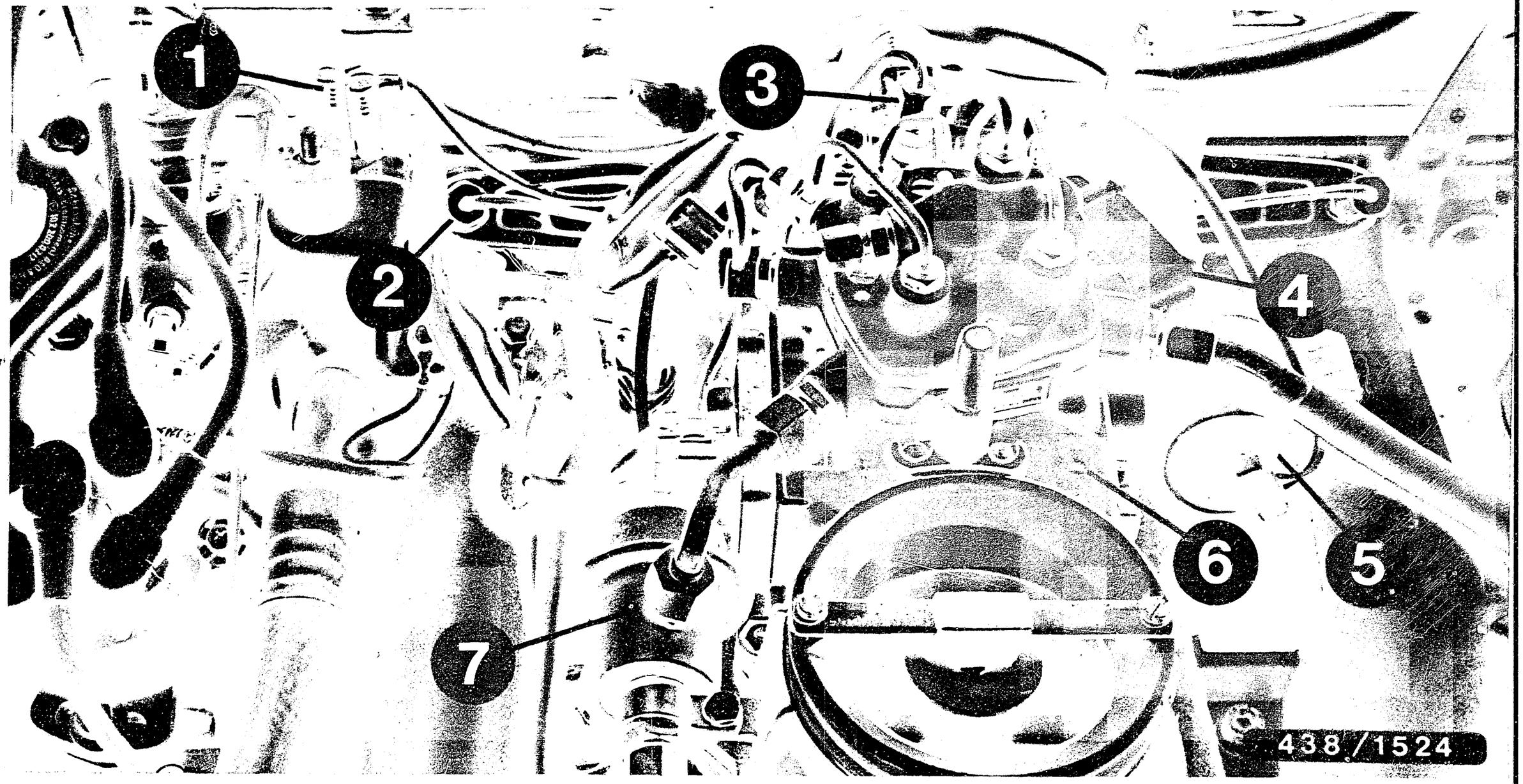
1 = Electronic relay for electric fuel pump and cold-start valve actuation

2 = Over-voltage protection relay

3 = KE-Jetronic control unit

4 = ABS controller (if present)

INSTALLATION POSITION OF COMPONENTS



1 = Engine temperature sensor
2 = Injection valves
3 = Cold-start valve
4 = Pressure actuator
5 = Idle actuator
6 = Mixture-control unit
7 = Pressure regulator

INSTALLATION POSITION OF COMPONENTS

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5005

BOSCH system : KE 3.1 - Jetronic

Make of vehicle : Mercedes-Benz

Basic microcard : PKW-014

Note:
Items without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* This microcard contains the trouble-shooting instructions, valid at the time of publication, for the following Mercedes-Benz model:

  300 E/TE/SE, 3,0l/6-Zyl. US/J/AUS 07.85->

* Trouble-shooting with these instructions may only then take place when the details of the "Summary - Service Information for Vehicles" (KFZ-000) coincide with those of the vehicle type and with the BOSCH number of the KE-Jetronic control unit installed.

* Control unit using digital techniques, characteristic-map control using microprocessor.

* Electronically controlled low-idle-speed control with single-winding rotary actuator, without bypass adjusting screw.

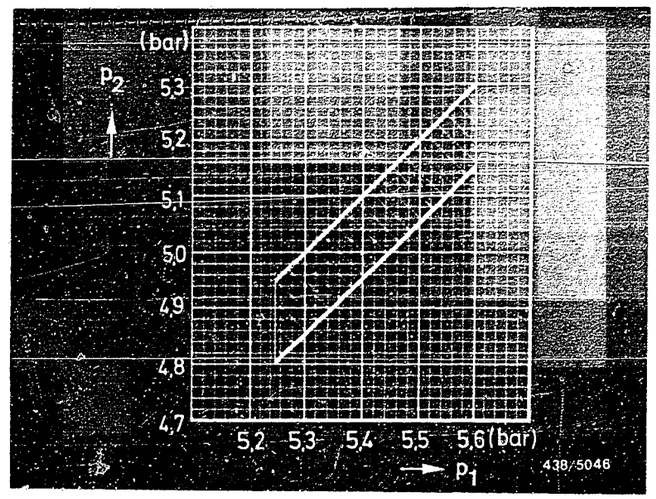
* Activated-carbon filter and regeneration valve for return of gasoline vapors into the intake manifold. (Fuel evaporation system)

Important note:

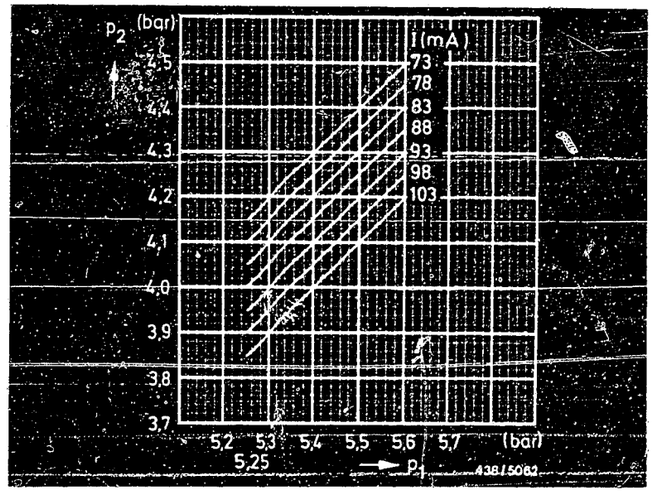
If reference is made to a basic microcard, always make sure you use the test specifications from the vehicle-specific brief instructions.

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	at least 1300 cm^3 /min	
2	Primary pressure:	5,25...5,6 bar	
3	Differential pressure: Suppression of peak coil current: actuate starting motor with fuel-pump relay disconnected. Do <u>not</u> switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0,15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 2,7 bar 2,6 bar	
5	Injection valves, opening pressure:	3,0...4,1 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA) Idle: Part load: Full load: Min. delivery at max. air-flow sensor plate defl.:	Setting point: (cm^3 /min) 6,0 40,0 100,0 140 cm^3 /min	Max. permis. delivery: (cm^3 /min) 6,6 42,5 109,0



p_1 = Primary pressure
p_2 = Lower-chamber pressure

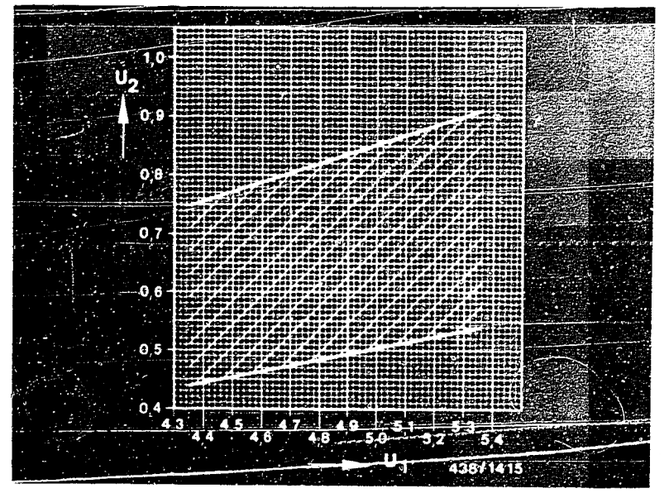


TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
7	Rate of flow, KE restriction:	130...150 cm^3 /min
8	Temperature sensor, air (NTC I): Air temperature +15...+30°C:	—— k Ω
9	Temperature sensor, engine (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting. Fuel-distributor seat - needle bearing:	 20,9...21,6 mm
11	Idle adjustment: Low-idle-speed control: adjustment of idle-air quantity not possible. For testing, engine at norm. op. temp. Idle speed: Engage driving position, speed: Check lambda closed-loop control: Measurement with lambda closed-loop control tester (e.g. KDJE-P 600) and adpater lead (e.g. KDJE-P 600/52) at diagnosis socket outlet (pin 3). Alternatively: Current measurement using universal test adapter. Put fuel evaporation system out of operation. Determine on/off ratio (mean value) at n = 2500 min^{-1} . Deviation of on/off ratio (mean value) at idle compared to n = 2500 min^{-1} : Adjustment at idle-mixture-adjusting screw. After adjustment, repeat measurement.	 620...720 min^{-1} 500...600 min^{-1} -10...+10 %

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
12	Signal, air-flow sensor potentiometer: (Checking necessary when poor idle and/or part-load behavior) Measurement using test adapter and voltmeter. Determine supply voltage of potentiometer: Set value (test adapter, V-position 10): Determine potentiometer signal at idle speed. (Test adapter, V-position 11) Set value corresponding to supply voltage: Adjust signal if necessary at trimming potentiometer (at right next to potentiometer pins). Afterwards, re-secure adjusting screw of trimming potentiometer using black sealing compound (e.g Teroson).	 4,35...5,35 V See chart



U_1 = Supply voltage potentiometer

U_2 = Potentiometer voltage signal
p1 = Primary pressure
p2 = Lower-chamber pressure

SELF-DIAGNOSIS

All Daimler-Benz 4- and 6-cylinder engines in the current series (approx. 10.85) are equipped with self-diagnosis using on-off ratio measurement.

Incorrect input signals from the KE-Jetronic control unit can be displayed with the lambda closed-loop tester at the lambda test output (diagnosis socket, socket 3).

This provides information on short and open circuits. Defects which occur sporadically (e.g. loose contacts) are not indicated. Output of fault signals has priority over output of the lambda closed-loop signal.

We will not go into the defects which can be indicated in more detail here, since the input signals of the KE-Jetronic control unit can be tested with the universal test adapter (rapid-diagnosis chart).

However, if when testing the lambda closed-loop control by means of on-off ratio measurement, a constant on-off ratio is indicated, then the input signals of the KE-Jetronic control unit should be tested (rapid diagnosis chart).

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER
ETT 018.01 WITH KE3 ADAPTER LEAD
1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the the KE-Jetronic, inlcuding the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

A t t e n t i o n :

When carrying out the test, make sure that the trimming plug is in position 1.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	| V	4	–	Internal resistance (R_i) press. actu.	12–10	Disconnect control-unit plug.	20... 30 Ω
2	| V	5	–	Resistance NTC II (engine)	21– 2	Engine temperature +15...+30°C: approx. +80°C:	1,3...3,6 k Ω 250...390 Ω
3				Resistance NTC I (intake air)		Air temperature in area of NTC I = +15...+30°C:	Test step not applicable
4	| V	6	–	Signal, altitude sensor	11– 2	Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	 3,2...4,5 V 2,8...4,0 V 2,4...3,5 V 2,0...3,0 V 1,6...2,5 V 0,8...1,6 V
5	| V	9	–	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	 0...10 Ω > 1000 Ω
6	| V	10	–	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	infinite Ω 0...10 Ω
7	| V	11	–	Microswitch idle linkage	24– 2	Throttle valve closed: open:	0...10 Ω infinite Ω
8	| V	12	–	Ground, control unit	20– 2		0...10 Ω
9	| V	13	–	Ground, pin 7	7– 2	Switch off ignition. Connect control unit.	 0...10 Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
10	| V	14	–	Trimming plug mixture map	22– 2	Disconnect control-unit plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) to engine ground. Trimming-plug position 1: 2: 3: 4: 5: 6: 7:	 0...10 Ω —— Ω —— Ω —— Ω —— Ω —— Ω —— Ω
11	| V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer. Selection lever position P,N: Driving position selected:	 0...10 Ω infinite Ω
12	5	–	–	TD signal	25– 2	Start engine (starting motor):	Voltage undefined
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	8...15 V
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	8...15 V
16	9	–	–	Air-conditioner cut-in signal	19– 2	Switch off ignition. Connect control unit. Start engine, switch on air conditioner. Temperature regulator = minimum temperature	 8...15 V
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,35 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
18	11	–	–	Signal, air-flow sensor potentiometer	17– 2	Switch on ignition. Air-flow sensor plate in neutral position: Defect air-flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V
19	13	–	1	Temperature signal form control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage indefined Voltage change
21	–	–	–	Peak coil current	12–12	Switch on ignition:	->FD 547: 9...11 mA FD 548 ->: 18...22 mA
22	–	–	1	Warm-up enrichment + 20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	->FD ——: ——— mA FD 547 ->: 2...5 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Engine at norm. op. temp., idle. Current value with btn 2 pressed; reading oscillating, mean value:	->FD ——: ——— mA FD 547 ->: –1...+1 mA
24	–	21	1	Starting enrichment	12–12	So that engine fails to start: Disconnect speed relay for electric fuel pump. Short circuit ignition coil term. 4 to ground via resistance of at least 2 k Ω . (e.g. with sleeve-type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 sec.) to:	->FD 640: 50...75 mA FD 641 ->: 40...60 mA

*) FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

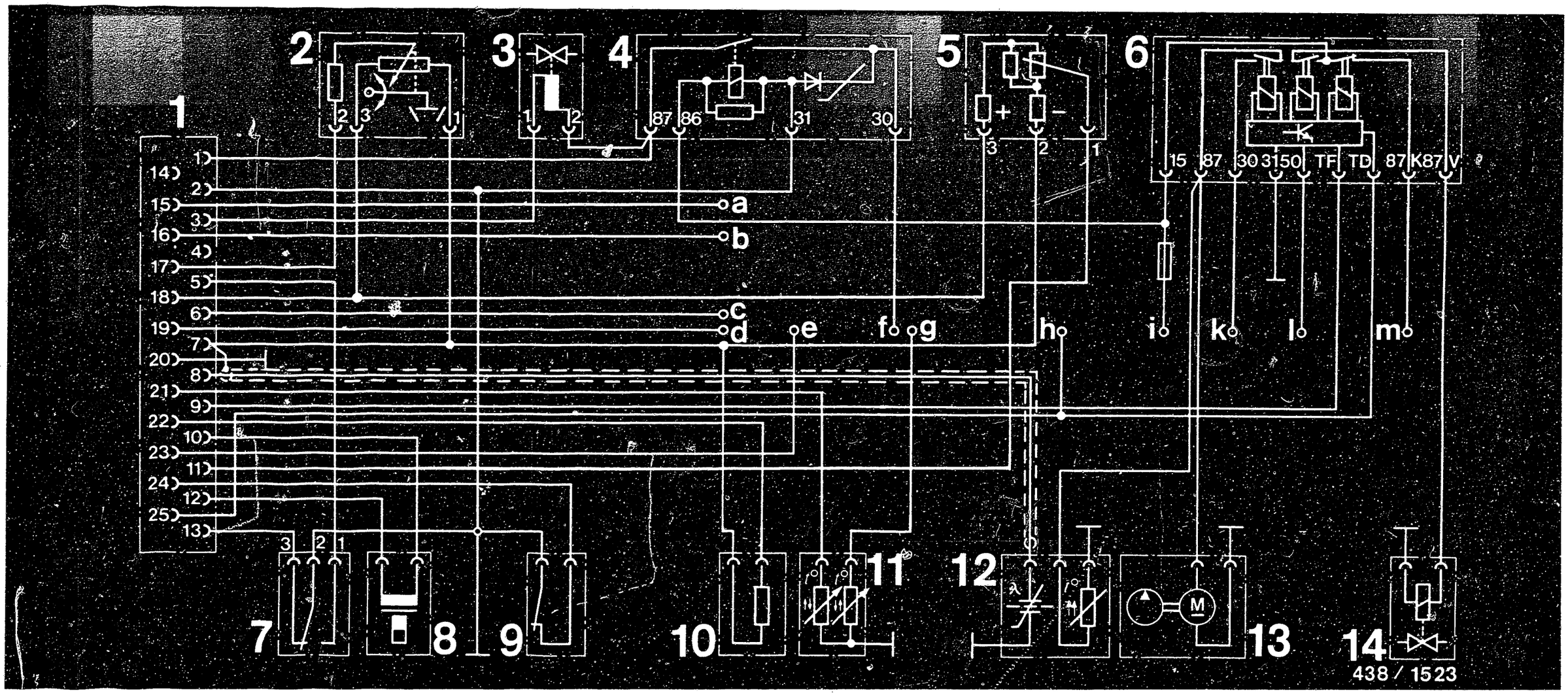
No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
25	–	21	1	Post-start enrichment	12–12	Start engine (at normal operating temperature) while actuating btn 1. Current value: Current value constant for approx: Then slow speed regulation to:	 ->FD 640: 9...14 mA FD 641 ->: 5... 8 mA ->FD 640: 30...60 s FD 641 ->: 15...25 s ->FD ——: ——— mA FD 547 ->: 2... 5 mA
26	–	21	1	Acceleration enrichment	12–12	Engine at normal operating temperature, idle. While actuating btn 1, perform snap acceleration of engine. Thus current rise (approx. 1 s) to: Note: Level of current value dependent upon intensity of acceleration (travel/duration of air-flow sensor flap movement).	 ->FD ——: ——— mA FD 547 ->: 40...70 mA
27	–	–	–	Overrun cut-off	12–12	Re-connect ammeter (swap positive and negative) Start engine (normal operating temperature). Speed n to approx.: Hold there. Manually actuate idle throttle-valve switch (for 4- and 6-cyl. engines, microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:	 ->FD 640: 3200 min $^{-1}$ FD 641 ->: 2000 min $^{-1}$ -40...-80 mA

*) FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specification CAT
28	–	24	–	Full-load enrichment	12-12	Engine at normal operating temperature, idle. Reading oscillating, mean value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: A t t e n t i o n: Do this very briefly, so that speed does not rise too much and engine is not damaged.	 ->FD ——: ——— mA FD 547 ->: -1...+1 mA ->FD ——: ——— mA FD 547 ->: 6...10 mA ——
29	–	21	–	Lambda closed-loop control, open-loop control mode	12-12	Disconnect regeneration lead to throttle-valve assembly at generation valve and seal. Engine at norm. op. temp., idle. Current value:	 -1...+1 mA
30	–	24	–	Lambda closed-loop control, closed-loop control mode	12-12	Engine at norm. op. temp., idle. Closed-loop control mode can be recognized from the oscillating current reading. Mean value: If mean value outside tolerance, set (idle-mixture-adjusting screw) to approx.:	 -1...+1 mA 0 mA
31	–	22	–	Lambda closed-loop control, rich stop	12-12	Engine at norm. op. temp., idle. Current rise to:	 12...16 mA
32	–	23	–	Lambda closed-loop control, lean stop	12-12	Engine at norm. op. temp., idle. Current drop to:	 -8...-12 mA

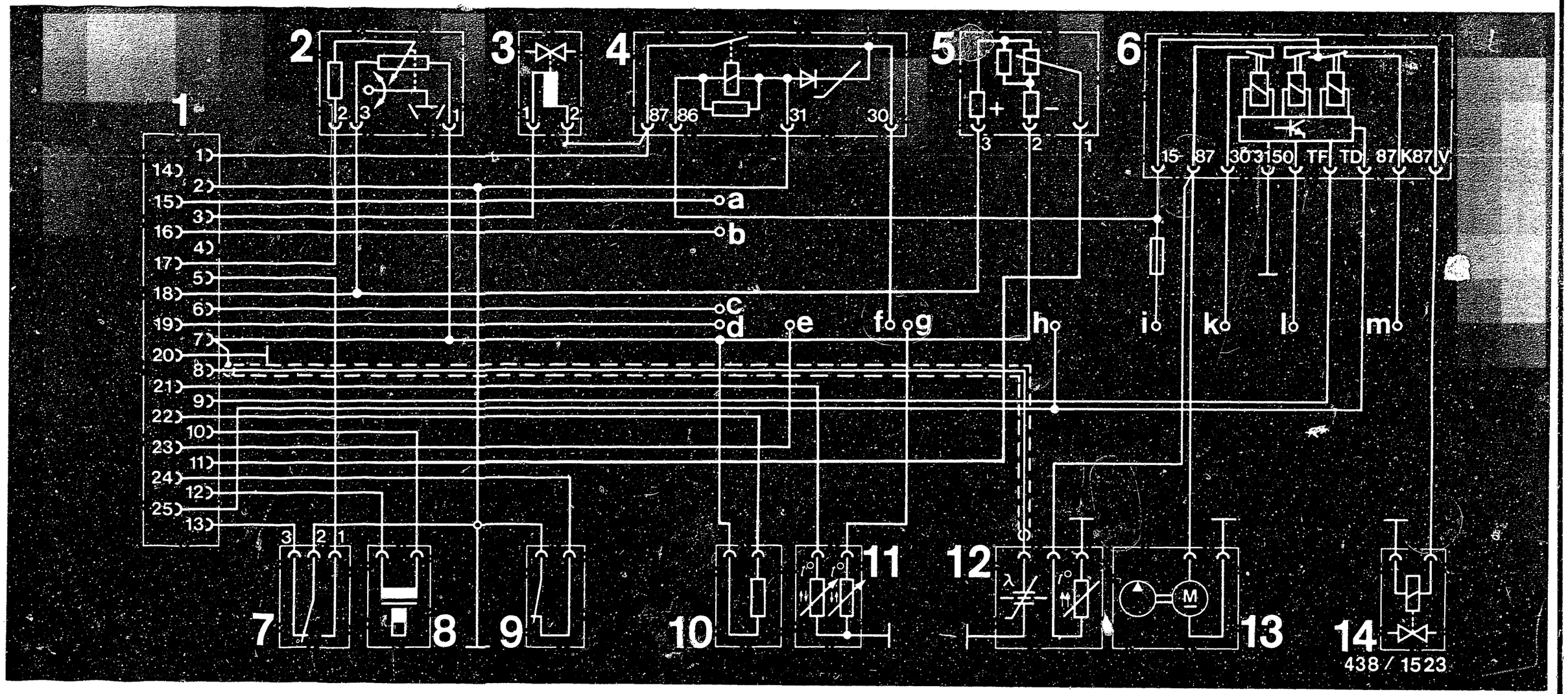
*) FD = Date of manufacture



1 = Control unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Idle actuator
4 = Over-voltage protection relay
5 = Altitude sensor
6 = Electronic relay for electric fuel pump and cold-start valve actuation
7 = Throttle-valve switch, idle/full load
8 = Electro-hydraulic pressure actuator
9 = Throttle-valve switch, idle/linkage
10 = Trimmer resistor, mixture map
11 = Temperature sensor, engine (Double NTC)
12 = Heated lambda sensor
13 = Electric fuel pump
14 = Cold-start valve

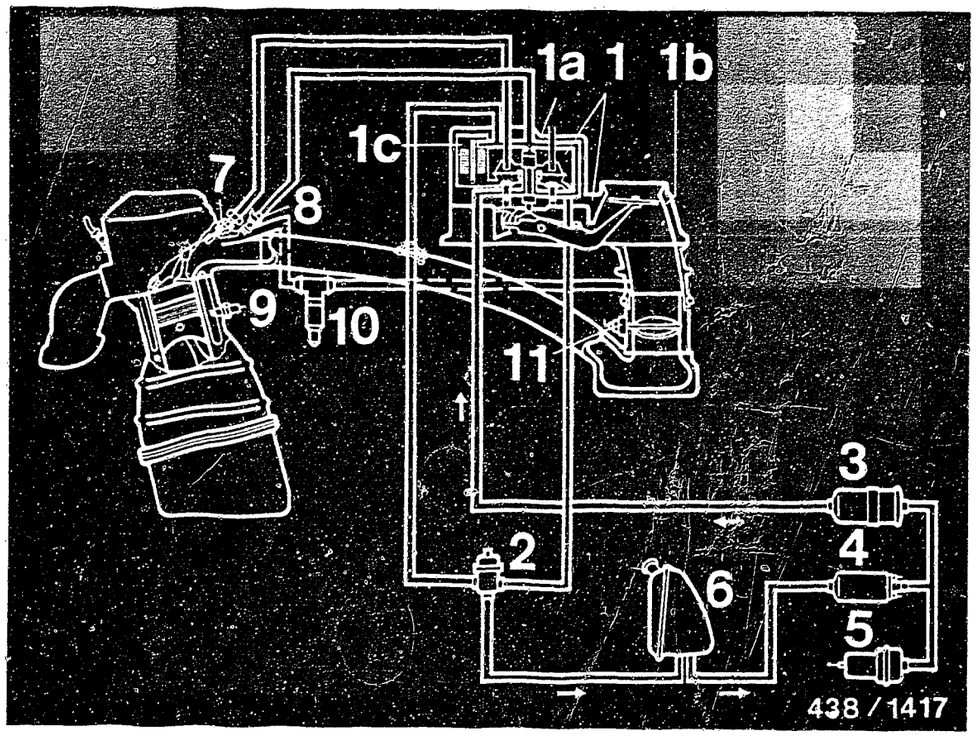
ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

H21 ⟹
H22 ⟺



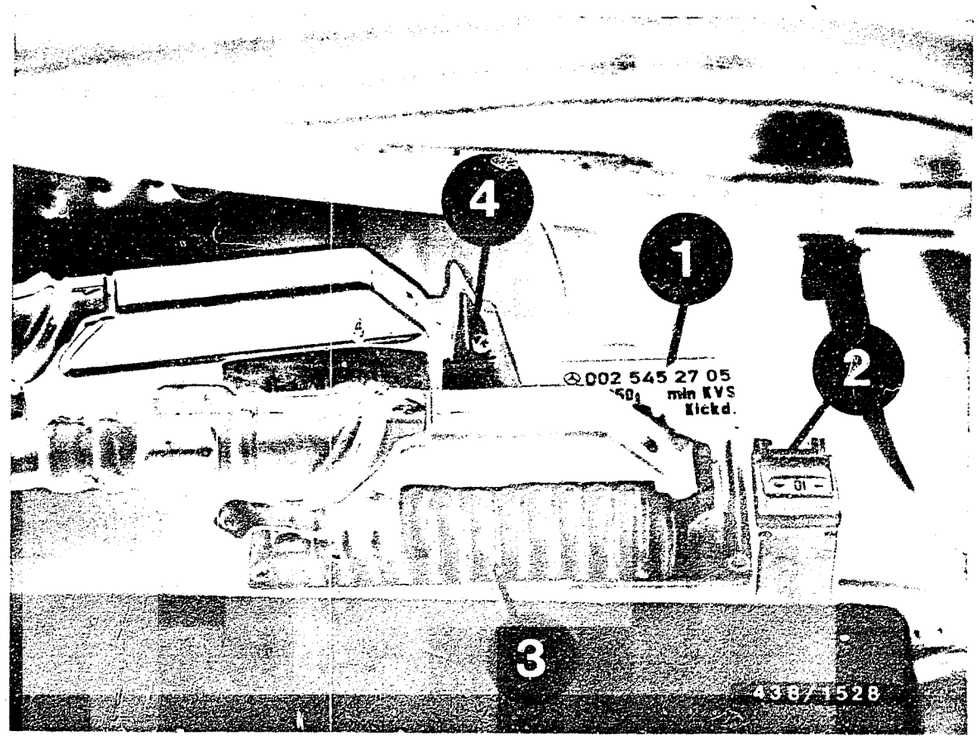
a = Lambda malfunction indicator
b = Transmission switch
c = Connection, Tempomat operating element
d = Connection, air-conditioner control unit
e = Lambda test output (diagnosis socket outlet, socket 3)
f = Terminal 30
g = Ignition system (EI)
h = Terminal TD, ignition
i = Terminal 15
k = Terminal 30
l = Terminal 50
m = Kick-down switch, socket 1

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT (CONTINUATION)



1 = Mixture-control unit
1a = Fuel distributor
1b = Air-flow sensor
1c = Electro-hydraulic pressure actuator
2 = Pressure regulator, primary pressure
3 = Fuel filter
4 = Electric fuel pump
5 = Fuel accumulator
6 = Fuel tank
7 = Injection valve
8 = Cold-start valve
9 = Temperature sensor engine (Double NTC)
10 = Idle actuator
11 = Throttle-valve switch, idle/full load

DIAGRAM OF AIR AND FUEL LINES



1 = Electronic relay for electric-fuel-pump and cold-start valve actuation

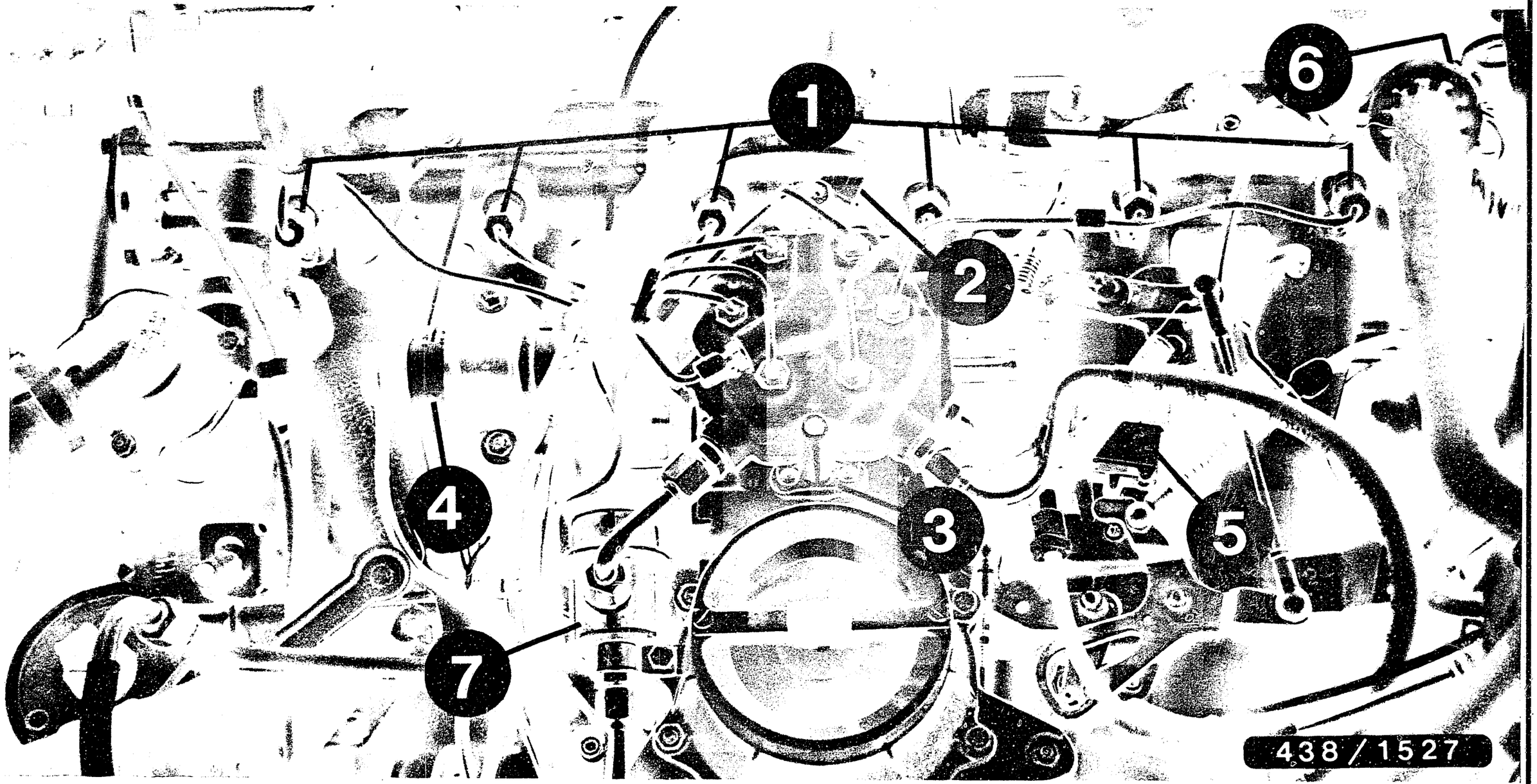
2 = Over-voltage protection relay

3 = KE-Jetronic control unit

4 = ABS controller (if present)

In Type 126, the electric fuel pump relay and the over-voltage protection relay are positioned in the engine compartment on the left.
The KE-Jetronic control unit and the mixture map trimming plug are installed in the footwell on the right behind the side panel in the Type 126.

INSTALLATION POSITION OF COMPONENTS



1 = Fuel-injection valves
2 = Start valve
3 = Mixture-control unit
4 = Idle actuator
5 = Throttle-valve switch, idle (microswitch on accelerator linkage)
6 = Engine-temperature sensor (concealed)
7 = Pressure regulator

INSTALLATION POSITION OF COMPONENTS

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5006

BOSCH system : KE 3.1 - Jetronic

Make of vehicle : Mercedes-Benz

Basic microcard : MB-525

Note:
Items without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* These instructions contain the trouble-shooting instructions, valid at the time of publication, for the following model:

  MERCEDES-BENZ
  230 GE, 2,3 1/4-Zyl.Mot. 01.86->

* Trouble-shooting with theses instructions may only then take place when the details of the "Summary - Service Information for Vehicles" (KFZ-0..) coincide with those of the vehicle type and with the BOSCH number of the KE-Jetronic control unit installed.

* Control unit using digital techniques, characteristic-map control using microprocessor.

* Multi-functional fuel-management system with a characteristic map for operation with lambda closed-loop control (CAT) and a characteristic map for operation without lambda closed-loop control (ECE). Activation of the characteristic maps by trimming plug with corresponding marking. To set to the fuel grades unleaded regular and unleaded premium, only the ignition trimming plug must be re-connected.

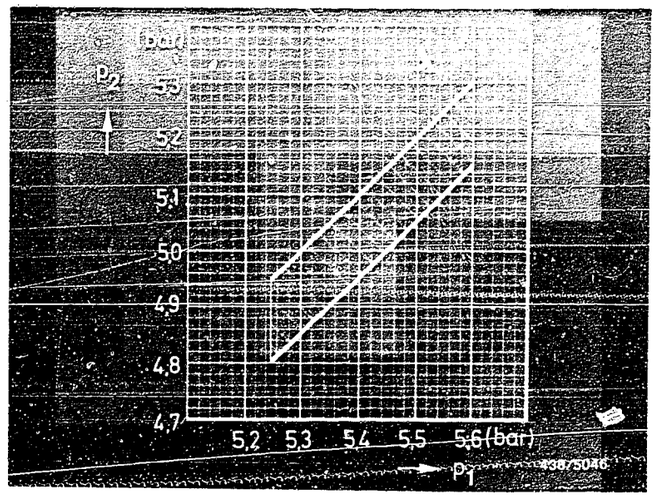
* Electronically controlled idle-speed control with single-winding rotary actuator, without bypass adjusting screw.

* Activated-carbon filter and regeneration valve for return of gasoline vapors into the intake manifold. (Fuel evaporation system)

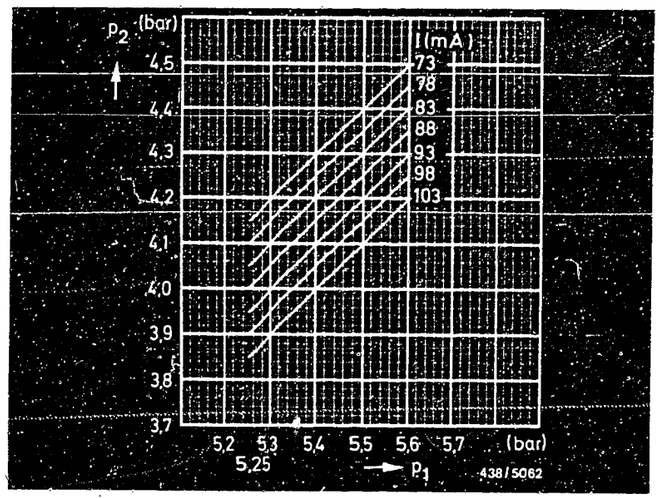
Important note:
If reference is made to a basic microcard, always make certain you use the test specifications from the vehicle-specific brief instructions.

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	at least 1100 cm ^{3} /min	
2	Primary pressure:	5,25...5,6 bar	
3	Differential pressure: Suppression of peak coil current: actuate starting motor with fuel-pump relay disconnected. Do <u>not</u> switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0.15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 2,7 bar 2,6 bar	
5	Injection valves, opening pressure:	3,0...4,1 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA)	Setting point: (cm ^{3} /min)	Max. permis. delivery: (cm ^{3} /min)
	Idle: Part load: Full load:	6,0 40,0 100,0	6,6 42,5 109,0
	Min. delivery at max. air-flow sensor plate defl.:	140 cm ^{3} /min	



p_1 = Primary pressure
p_2 = Lower-chamber pressure

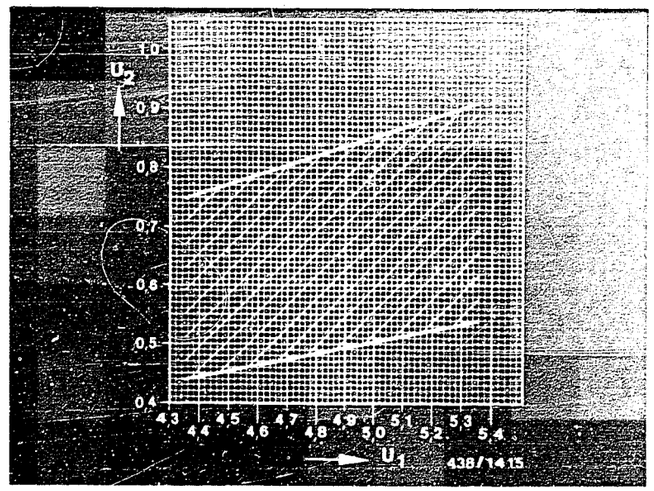


TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
7	Rate of flow, KE restriction:	130...150 cm^3 /min
8	Temperature sensor, air (NTC I): Air temperature +15...+30°C:	 1,3...3,6 k Ω
9	Temperature sensor, engine (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting: Fuel-distributor seat - needle bearing:	 20,9...21,6 mm
11	Idle adjustment: Low-idle-speed control: adjustment of idle-air delivery not possible. For testing, engine at norm. op. temp. Idle speed: Engage driving position, speed: Engage driving position and switch on air conditioner, speed: <u>Only ECE:</u> CO concentration in exhaust gas: <u>Only CAT:</u> Check lambda closed-loop control: Measurement with lambda closed-loop control tester (e.g. KDJE-P 600) and adapter lead (e.g. KDJE-P 600/52) at diag. socket outlet (pin3). Alternatively: Current measurement using universal test adapter. Put fuel evaporation system out of operation. On-off ratio fluctuating, mean value: Adjustment at idle-mixture-adjusting screw.	 700...800 min^{-1} 620...720 min^{-1} > 720 min^{-1} 0,5...1,5 % CO by vol. 45...55 %

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
12	Signal, air-flow sensor potentiometer: (Checking necessary when poor idle and/or part-load behavior) Measurement using test adapter and voltmeter. Determine supply voltage of potentiometer: Set value (test adapter, V-position 10): Determine potentiometer signal at idle speed. (Test adapter, V-position 11) Set value corresponding to supply voltage: Adjust signal if necessary at trimming potentiometer (at right next to potentiometer pins). Afterwards, re-secure adjusting screw of trimming potentiometer using black sealing compound (e.g Teroson).	 4,35...5,35 V See chart



U_1 = Supply voltage potentiometer

U_2 = Potentiometer voltage signal

p1 = Primary pressure

p2 = Lower-chamber pressure

SELF-DIAGNOSIS

All Daimler-Benz 4- and 6-cylinder engines in the current series (approx. 10.85) are equipped with self-diagnosis using on-off ratio measurement.

Incorrect input signals from the KE-Jetronic control unit can be displayed with the lambda closed-loop tester at the lambda test output (diagnosis socket, socket 3).

This provides information on short and open circuits. Defects which occur sporadically (e.g. loose contacts) are not indicated. Output of fault signals has priority over output of the lambda closed-loop signal.

We will not go into the defects which can be indicated in more detail here, since the input signals of the KE-Jetronic control unit can be tested with the universal test adapter (rapid-diagnosis chart).

However, if when testing the lambda closed-loop control by means of on-off ratio measurement, a constant on-off ratio is indicated, then the input signals of the KE-Jetronic control unit should be tested (rapid diagnosis chart).

RAPID DIAGNOSIS CHART TO UNIVERSAL TEST ADAPTER ETT 018.01 WITH KE3 ADAPTER LEAD 1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the KE-Jetronic, including the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

The "Test specifications" column contains the test specifications for both the version without lambda closed-loop control (ECE, left-hand test-specifications column) and for the version with lambda closed-loop control (CAT, right-hand test-specifications column). Before starting testing, determine which version is being tested. If only one test specification is given, this applies to both versions.

Attention: When carrying out the test, make sure that the trimming plug is in position 1.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	| V	4	–	Int. resistance(R_i) pressure actuator	12–10	Disconnect control-unit lead plug.	20...30 Ω
2	| V	5	–	Resistor NTC II (engine)	21– 2	Engine temperature +15°...+30° C: approx. +80° C :	1,3...3,6 k Ω 250...390 Ω
3	| V	6	–	Resistor NTC I (intake air)	11– 2	Air temperature in area of NTC I: +15°...+30° C:	1,3...3,6 k Ω
4				Signal, altitude sensor		Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	Test step not applicable!
5	| V	9	–	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	 0...10 Ω > 1000 Ω
6	| V	10	–	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	infinite Ω 0...10 Ω
7	| V	11	–	Microswitch idle linkage	24– 2	Throttle valve closed: open:	0...10 Ω infinite Ω
8	| V	12	–	Ground, control unit	20– 2		0...10 Ω
9	| V	13	–	Ground, pin 7	7– 2	Switch off ignition. Connect control unit.	0...10 Ω

RAPID DAIGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Switch/Btn Ω	Switch/Btn Btn	Under test	Test pins	Test conditions	Test specifications ECE	Test specifications CAT
10	V	14	–	Trimming plug mixture map	22– 2	Disconnect control-unit lead plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) with engine ground. Trimming-plug position 1: 2: 3: 4: 5: 6: 7:	 50... 60 Ω 100...120 Ω 150...190 Ω 230...270 Ω 330...370 Ω 430...470 Ω 570...620 Ω	 900... 1050 Ω 1200... 1350 Ω 1500... 1750 Ω 2000... 2400 Ω 3000... 3600 Ω 5000... 5600 Ω 11000...12000 Ω
11	V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer. Selection lever in position P, N: Driving position selected:	0...10 Ω Infinite Ω	
12	5	–	–	TD signal	25– 2	Start engine (starting motor):	Voltage indefined	
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V	
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	8...15 V	
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	8...15 V	
16	9	–	–	Air-conditioner cut-in signal	19– 2	Connect control unit. Start engine, switch on air conditioner. Temperature regulator = minimum temperature:	 8...15 V	
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,35 V	

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specificatons ECE	CAT
18	11	–	–	Signal, air-flow sensor potentiometer	17– 2	Switch on ignition. Air-flow sensor plate in neutral position: Deflect air-flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V	
19	13	–	1	Temperature signal from control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V	
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage indefined Voltage change	
21	–	–	–	Peak coil current	12–12	Switch on ignition:	->FD —— : ——— mA FD 552->: 9...11 mA	->FD —— : ——— mA FD 552->: 18...22 mA
22	–	–	1	Warm-up enrichment +20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	->FD —— : ——— mA FD 552->: 12...16 mA	->FD —— : ——— mA FD 552->: 6... 8 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Eng. at norm. op. temp., idle Current valve with btn 2 pressed: With CAT, oscillating, mean value:	->FD —— : ——— mA FD 552->: –4...+7 mA	->FD —— : ——— mA FD 552->: –1...+1 mA
24	–	21	1	Starting enrichment	12–12	So that eng. fails to start: Disconnect speed relay for elec. fuel pump. Short circuit ign. coil term.4 to grnd via resist. of at least 2k Ω (E.g. with sleeve-type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 s.) to:	->FD —— : ——— mA FD 552->: 65...85 mA	->FD —— : ——— mA FD 552->: 39...49 mA

FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Switch/Btn Ω	Switch/Btn Btn	Under test	Test pins	Test conditions	Test specifications ECE		Test specifications CAT	
25	–	21	1	Post-start enrichment	12-12	Start engine (at normal op. temp.) while actuating btn 1.				
						Current value:	->FD —— :	——— mA	->FD —— :	——— mA
							FD 552->:	23...29 mA	FD 552->:	12...16 mA
						Current value const. for app.	->FD —— :	——— s	->FD —— :	——— s
							FD 552->:	2... 6 s	FD 552->:	1... 5 s
						Then slow speed reg. to:	->FD —— :	——— mA	->FD —— :	——— mA
							FD 552->:	12...16 mA	FD 552->:	6... 8 mA
26	–	21	1	Acceleration enrichment	12-12	Eng. at norm. op. temp., idle While actuating btn 1, perform snap acceleration of eng Thus current rise (approx. 1 s) to:	->FD —— :	——— mA	->FD —— :	——— mA
							FD 552->:	50...70 mA	FD 552->:	40...60 mA
						Note: Level of current value dependent upon intensity of acceleration (travel/ duration of air-flow sensor plate movement).				
27	–	–	–	Overrun cut-off	12-12	Re-connect ohmmeter (swap positive and negative). Start eng. (norm. op. temp.). Speed n to approx.:	->FD —— :	——— min^{-1}	->FD —— :	——— min^{-1}
						Hold there.	FD 552->:	2000 min^{-1}	FD 552->:	2000 min^{-1}
						Manually actuate idle throttle-valve switch (for 4- and 6- cyl. eng. microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:		-40...-80 mA		-40...-80 mA

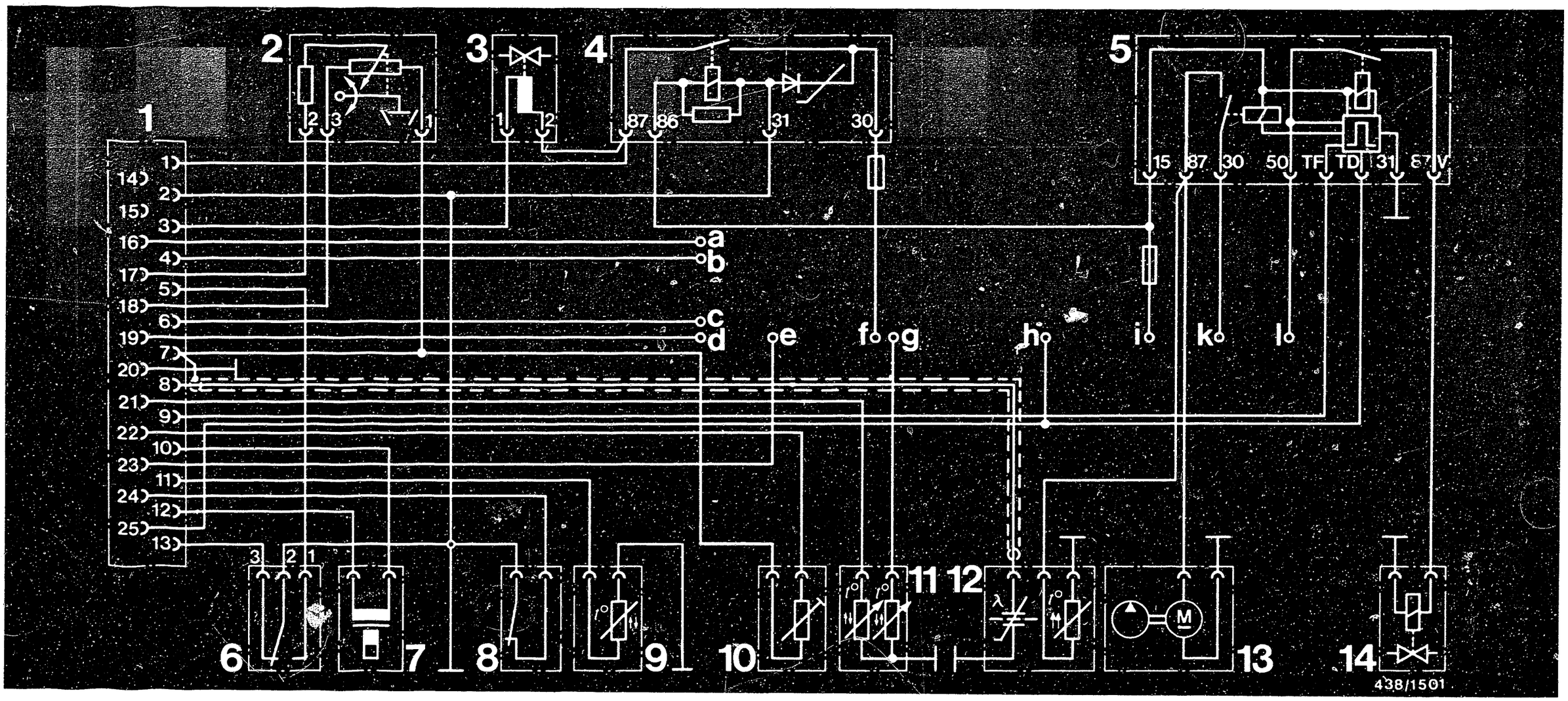
FD = Date of manufacture

No.	Switch/Btn V	Switch/Btn Ω	Switch/Btn Btn	Under test	Test pins	Test conditions	Test specifications ECE	Test specifications CAT
28	–	24	–	Full-load enrichment	12–12	Eng. at norm. op. temp., idle Current value (ECE): With CAT, oscil., mean value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: Attention: Do this very briefly, so that speed does not rise too much and engine is not damaged.	–>FD —— : ——— mA FD 552–>: –4...+7 mA –>FD —— : ——— mA FD 552–>: 6... 9 mA	–>FD —— : ——— mA FD 552–>: –1...+1 mA –>FD —— : ——— mA FD 552–>: 6... 9 mA
29	–	21	–	Lambda closed-loop control, open-loop control mode	12–12	Disconnect regeneration lead to throttle-valve assembly at regeneration valve and seal. Eng. at norm. op. temp., idle Current value:	——	–1...+1 mA
30	–	24	–	Lambda closed-loop control, closed-loop control mode	12–12	Eng. at norm. op. temp., idle Closed-loop control mode can be recognized from the oscillating current reading. Mean value: If mean value outside tolerance, set (idle-mixture-adjusting screw) to:	—— ——	–1...+1 mA approx. 0 mA
31	–	22	–	Lambda closed-loop control, rich stop	12–12	Eng. at norm. op. temp., idle Current rise to:	——	13...17 mA
32	–	23	–	Lambda closed-loop control, lean stop	12–12	Eng. at norm. op. temp., idle Current drop to:	——	–8...–10 mA

FD = Date of manufacture

J19 — <⟹>

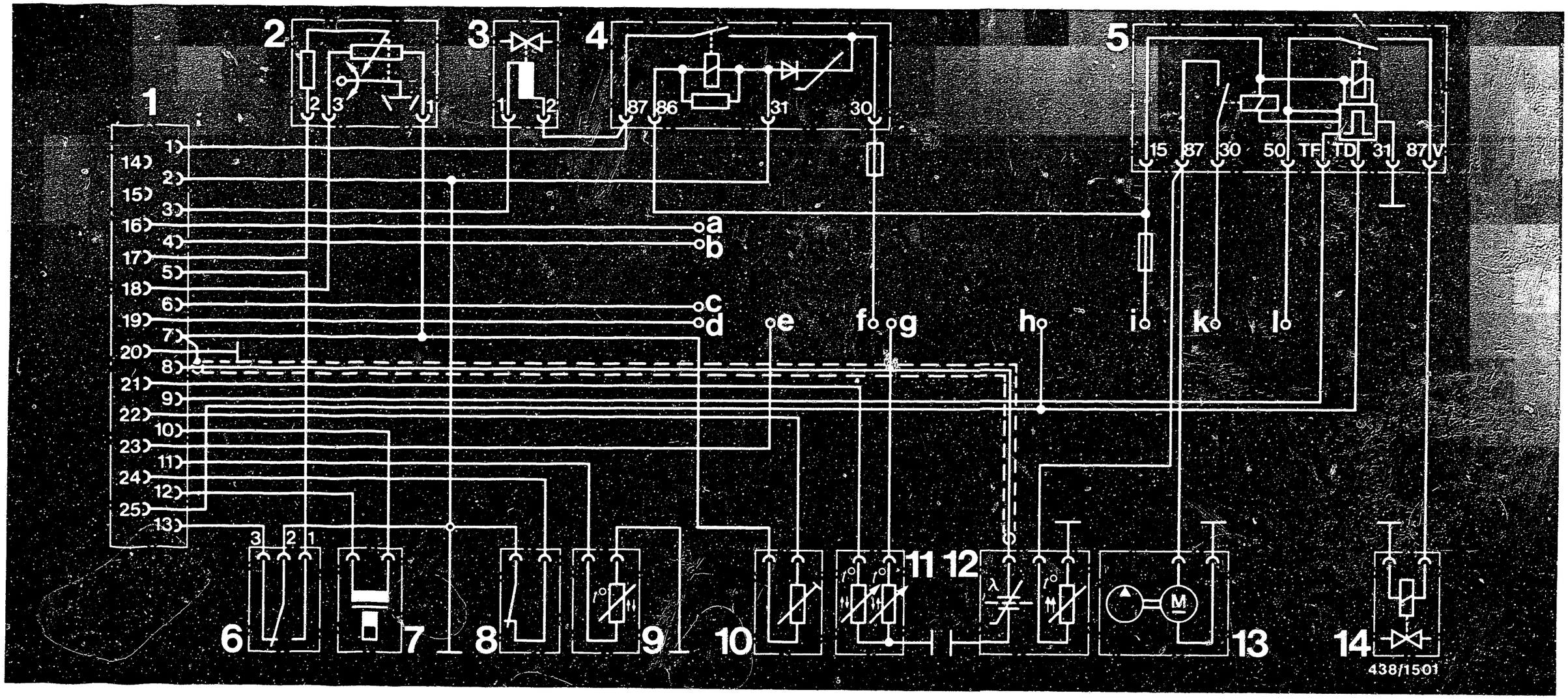
J20 — <⟹



1 = Control-unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Idle actuator
4 = Over-voltage protection relay
5 = Electronic relay for electric fuel pump and cold-start valve actuation
6 = Throttle-valve switch, idle/full load
7 = Electro-hydraulic pressure actuator
8 = Throttle-valve switch, idle/linkage
9 = Temperature sensor, intake air (NTC I)
10 = Trimming plug, map adjustment
11 = Temperature sensor, engine (Double NTC)
12 = Heated lambda sensor
13 = Electric fuel pump
14 = Cold-start valve

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

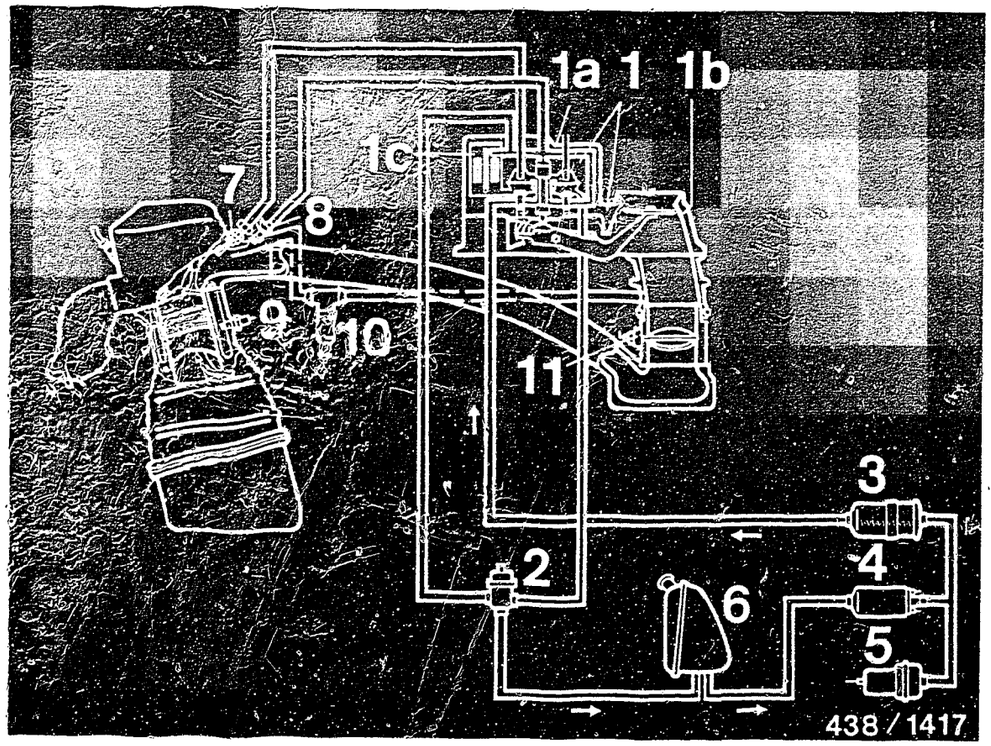
J21 —⟹
J22 —⟸⟹



a = Transmission switch (only Automatic)
b = Consumption signal
c = Connection of Tempomat operating element
d = Connection of air-conditioner control unit
e = Lambda test output

f = Terminal 30 (B +)
g = Ignition system (EI-L)
h = TD signal, ignition
i = Terminal 15
k = Terminal 30 (B +)
l = Terminal 15a - starting motor

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT (CONTINUED)



1 = Mixture-control unit
1a = Fuel distributor
1b = Air-flow sensor
1c = Electro-hydraulic pressure actuator
2 = Pressure regulator, primary pressure
3 = Fuel filter
4 = Electric fuel pump
5 = Fuel accumulator
6 = Fuel tank
7 = Injection valve
8 = Cold-start valve
9 = Temperature sensor engine (Double NTC)
10 = Idle actuator
11 = Throttle-valve switch, idle/full load

DIAGRAM OF AIR AND FUEL LINES

INSTALLATION POSITION OF COMPONENTS

(Installation position of components on engine corresponding to Type 230 E)

Mixture-control unit:
Above intake manifold and venturi assembly.

Primary-pressure regulator:
Between intake manifold 1 and 2.

Injection valves:
In the flanges of the intake tubes.

Electric fuel pump, filter, accumulator:
At vehicle floor in area of fuel tank.

Temperature sensor, engine:
At cylinder head.

Control unit, KE-Jetronic:
In footwell at right.

Fuel-pump relay:
In engine compartment at left, central electrics.

Idle actuator:
Between the intake tubes 3 and 4.

Throttle-valve switch:
At venturi assembly, throttle shaft.

Microswitch, idle:
At throttle linkage in area in front of mixture-control unit.

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5007

BOSCH system : KE 3.1 - Jetronic

Make of vehicle : Mercedes-Benz

Basic microcard : PKW-014

Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* These instructions contain the trouble-shooting instructions, valid at the time of publication, for the following model:

  MERCEDES-BENZ
  260 E, SE 2,61/6Zyl. 07.85->
  190 E 2.6 2,6 1/6Zyl. 04.86->

* Trouble-shooting with theses instructions may only then take place when the details of the "Summary - Service Information for Vehicles" (KFZ-0..) coincide with those of the vehicle type and with the BOSCH number of the KE-Jetronic control unit installed.

* Control unit using digital techniques, characteristic-map control using microprocessor.

* Multi-functional fuel-management system with a characteristic map for operation with lambda closed-loop control (CAT) and a characteristic map for operation without lambda closed-loop control (ECE). Activation of the characteristic maps by trimming plug with corresponding marking. To set to the fuel grades unleaded regular and unleaded premium, only the ignition trimming plug must be re-connected.

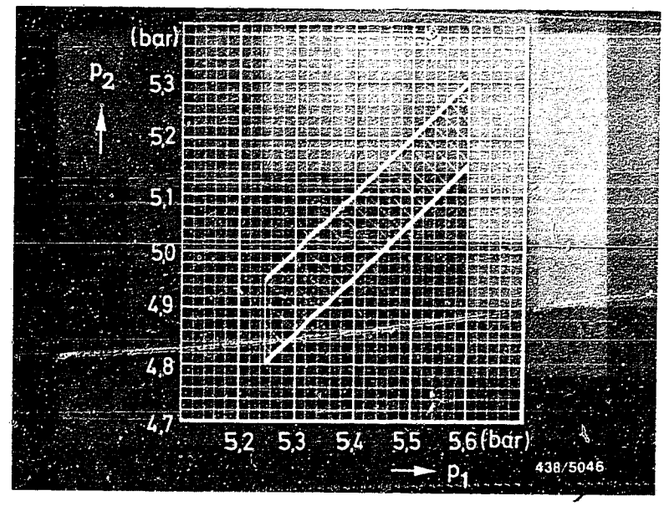
* Electronically controlled idle-speed control with single-winding rotary actuator, without bypass adjusting screw.

* Activated-carbon filter and regeneration valve for return of gasoline vapors into the intake manifold. (Fuel evaporation system)

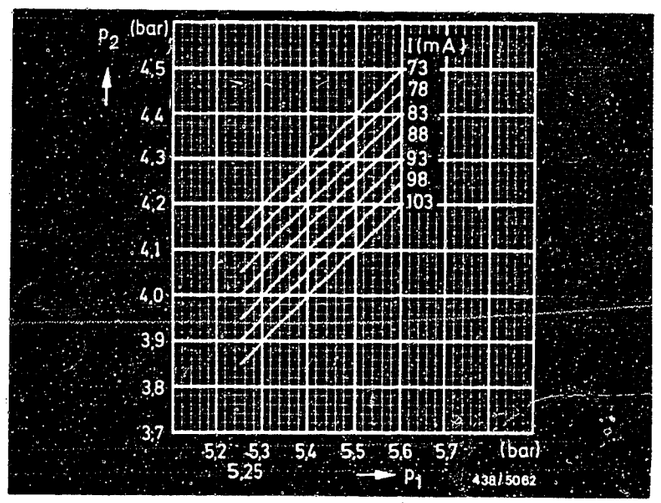
Important note:
If reference is made to a basic microcard, always make certain you use the test specifications from the vehicle-specific brief instructions.

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	at least 1300 cm^3 /min	
2	Primary pressure:	5,25...5,6 bar	
3	Differential pressure: Suppression of peak coil current: actuate starting motor with fuel-pump relay disconnected. Do <u>not</u> switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0,15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 2,7 bar 2,6 bar	
5	Injection valves, opening pressure:	3,0...4,1 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA)	Setting point: (cm^3 /min)	Max. permis. delivery: (cm^3 /min)
	Idle: Part load: Full load:	6,0 40,0 100,0	6,6 42,5 109,0
	Min. delivery at max. air-flow sensor plate defl.:	140 cm^3 /min	



p_1 = Primary pressure
p_2 = Lower-chamber pressure



K03 — ⟹

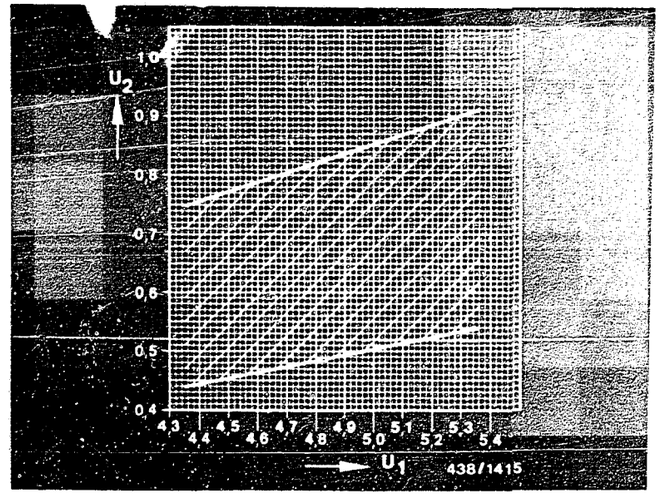
K04 — ⟺

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/requirements for testing	Test specification
7	KE-throttle flow-through quantity:	130...150 cm^3 /min
8	Air-temperature sensor (NTC I): Air temperature +15...+30°C:	 1,3...3,6 k Ω
9	Engine-temperature sensor (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw - basic adjustment: Fuel-distributor support - needle bearing:	 20,9...21,6 mm
11	Idle-speed adjustment: Idle-speed regulation: Adjustment of idle air quantity not possible. Engine must be at operating temperature for testing. Idle speed: Shift to driving position, engine speed: <u>ECE only</u>: CO concentration in exhaust: <u>CAT only</u>: Test lambda closed-loop control: Measurement with lambda closed-loop tester (e.g. KDJE-P 600) and adapter cable (e.g. KDJE-P 600/52) at diagnostic socket (pin 3). Alternative: current measurement with universal test adapter. Render fuel evaporation control system inoperative. Determine the on-off ratio (mean value) at n = 2500 min^{-1} . Deviation of the on-off ratio (mean value) in idle with respect to n = 2500 min^{-1} : Adjustment at idle-mixture-adjusting screw. After correction, repeat measurement.	 650...750 min^{-1} 550...650 min^{-1} 0,5...1,5 vol. % -10...+10 %

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
12	Signal, air-flow sensor potentiometer: (Checking necessary when poor idle and/or part-load behavior) Measurement using test adapter and voltmeter. Determine supply voltage of potentiometer: Set value (test adapter, V-position 10): Determine potentiometer signal at idle speed. (Test adapter, V-position 11) Set value corresponding to supply voltage: Adjust signal if necessary at trimming potentiometer (at right next to potentiometer pins). Afterwards, re-secure adjusting screw of trimming potentiometer using black sealing compound (e.g Teroson).	 4,35...5,35 V See chart



U_1 = Supply voltage potentiometer

U_2 = Potentiometer voltage signal

p1 = Primary pressure

p2 = Lower-chamber pressure

SELF-DIAGNOSIS

All Daimler-Benz 4- and 6-cylinder engines in the current series (approx. 10.85) are equipped with self-diagnosis using on-off ratio measurement.

Incorrect input signals from the KE-Jetronic control unit can be displayed with the lambda closed-loop tester at the lambda test output (diagnosis socket, socket 3).

This provides information on short and open circuits. Defects which occur sporadically (e.g. loose contacts) are not indicated. Output of fault signals has priority over output of the lambda closed-loop signal.

We will not go into the defects which can be indicated in more detail here, since the input signals of the KE-Jetronic control unit can be tested with the universal test adapter (rapid-diagnosis chart).

However, if when testing the lambda closed-loop control by means of on-off ratio measurement, a constant on-off ratio is indicated, then the input signals of the KE-Jetronic control unit should be tested (rapid diagnosis chart).

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The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the KE-Jetronic, including the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

The "Test specifications" column contains the test specifications for both the version without lambda closed-loop control (ECE, left-hand test-specifications column) and for the version with lambda closed-loop control (CAT, right-hand test-specifications column). Before starting testing, determine which version is being tested. If only one test specification is given, this applies to both versions.

Attention: When carrying out the test, make sure that the trimming plug is in position 1.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	V	4	—	Int. resistance(R_i) pressure actuator	12–10	Disconnect control-unit lead plug.	20...30 Ω
2	V	5	—	Resistor NTC II (engine)	21– 2	Engine temperature +15°...+30° C: approx. +80° C :	1,3...3,6 k Ω 250...390 Ω
3	V	6	—	Resistor NTC I (intake air)	11– 2	Air temperature in area of NTC I: +15°...+30° C:	1,3...3,6 k Ω
4				Signal, altitude sensor		Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	Test step not applicable!
5	V	9	—	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	 0...10 Ω > 1000 Ω
6	V	10	—	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	infinite Ω 0...10 Ω
7	V	11	—	Microswitch idle linkage	24– 2	Throttle valve closed: open:	0...10 Ω infinite Ω
8	V	12	—	Ground, control unit	20– 2		0...10 Ω
9	V	13	—	Ground, pin 7	7– 2	Switch off ignition. Connect control unit.	0...10 Ω

RAPID DAIGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
10	| V	14	–	Trimming plug mixture map	22– 2	Disconnect control-unit lead plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) with engine ground.		
						Trimming-plug position 1:	50... 60 Ω	900... 1050 Ω
						2:	100...120 Ω	1200... 1350 Ω
						3:	150...190 Ω	1500... 1750 Ω
						4:	230...270 Ω	2000... 2400 Ω
						5:	330...370 Ω	3000... 3600 Ω
						6:	430...470 Ω	5000... 5600 Ω
						7:	570...620 Ω	11000...12000 Ω
11	| V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer. Selection lever in position P, N:	0...10 Ω	
						Driving position selected:	Infinite Ω	
12	5	–	–	TD signal	25– 2	Start engine (starting motor):	Voltage indefined	
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V	
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	8...15 V	
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	8...15 V	
16	9	–	–	Air-conditioner cut-in signal	19– 2	Connect control unit. Start engine, switch on air conditioner. Temperature regulator = minimum temperature:	8...15 V	
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,35 V	

K13 — <⟹>

K14 — <⟹>

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specificatons ECE	CAT
18	11	–	–	Signal, air–flow sensor potentiometer	17– 2	Switch on ignition. Air–flow sensor plate in neutral position: Deflect air–flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V	
19	13	–	1	Temperature signal from control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V	
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage indefined Voltage change	
21	–	–	–	Peak coil current	12–12	Switch on ignition:	->FD —— : ——— mA FD 546–>: 9...11 mA	->FD —— : ——— mA FD 546–>: 18...22 mA
22	–	–	1	Warm–up enrichment +20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	->FD —— : ——— mA FD 546–>: 14...19 mA	->FD —— : ——— mA FD 546–>: 2... 6 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Eng. at norm. op. temp., idle Current valve with btn 2 pressed: With CAT, oscillating, mean value:	->FD —— : ——— mA FD 546–>: –4...+7 mA	->FD —— : ——— mA FD 546–>: –1...+1 mA
24	–	21	1	Starting enrichment	12–12	So that eng. fails to start: Disconnect speed relay for elec. fuel pump. Short circuit ign. coil term.4 to grnd via resist. of at least 2k Ω (E.g. with sleeve–type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 s.) to:	->FD —— : ——— mA FD 546–>: 65...85 mA	->FD —— : ——— mA FD 546–>: 50...70 mA

FD = Date of manufacture

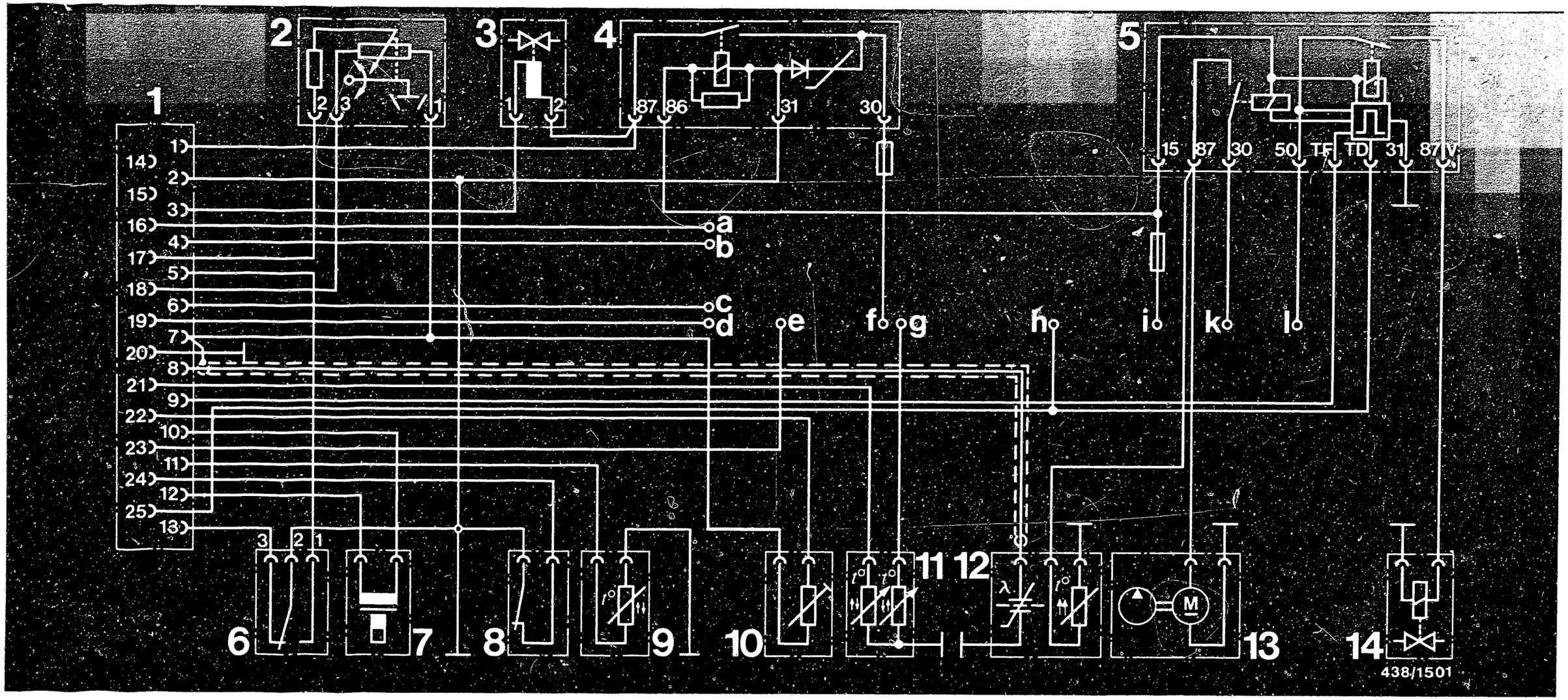
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Switch/Btn Ω	Switch/Btn Btn	Under test	Test pins	Test conditions	Test specifications ECE		Test specifications CAT	
25	–	21	1	Post-start enrichment	12-12	Start engine (at normal op. temp.) while actuating btn 1. Current value:	->FD —— :	——— mA	->FD —— :	——— mA
							FD 546->:	23...28 mA	FD 546->:	8...12 mA
						Current value const. for app.	->FD —— :	——— s	->FD —— :	——— s
							FD 546->:	5...15 s	FD 546->:	30...50 s
						Then slow speed reg. to:	->FD —— :	——— mA	->FD —— :	——— mA
							FD 546->:	14...19 mA	FD 546->:	2... 6 mA
26	–	21	1	Acceleration enrichment	12-12	Eng. at norm. op. temp., idle While actuating btn 1, perform snap acceleration of eng Thus current rise (approx. 1 s) to:	->FD —— :	——— mA	->FD —— :	——— mA
							FD 546->:	50...70 mA	FD 546->:	40...60 mA
						Note: Level of current value dependent upon intensity of acceleration (travel/ duration of air-flow sensor plate movement).				
27	–	–	–	Overrun cut-off	12-12	Re-connect ohmmeter (swap positive and negative). Start eng. (norm. op. temp.). Speed n to approx.:	->FD —— :	——— min^{-1}	->FD —— :	——— min^{-1}
						Hold there.	FD 546->:	2000 min^{-1}	FD 546->:	3400 min^{-1}
						Manually actuate idle throttle-valve switch (for 4- and 6- cyl. eng. microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:		-40...-80 mA		-40...-80 mA

FD = Date of manufacture

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications ECE	CAT
28	–	24	–	Full-load enrichment	12-12	Eng. at norm. op. temp., idle Current value (ECE): With CAT, oscil., mean value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: Attention: Do this very briefly, so that speed does not rise too much and engine is not damaged.	->FD —— : ——— mA FD 546->: -4...+7 mA ->FD —— : ——— mA FD 546->: 5... 9 mA	->FD —— : ——— mA FD 546->: -1...+1 mA ->FD —— : ——— mA FD 546->: 7...11 mA
29	–	21	–	Lambda closed-loop control, open-loop control mode	12-12	Disconnect regeneration lead to throttle-valve assembly at regeneration valve and seal. Eng. at norm. op. temp., idle Current value:	——	-1...+1 mA
30	–	24	–	Lambda closed-loop control, closed-loop control mode	12-12	Eng. at norm. op. temp., idle Closed-loop control mode can be recognized from the oscillating current reading. Mean value: If mean value outside tolerance, set (idle-mixture-adjusting screw) to:	—— ——	-1...+1 mA approx. 0 mA
31	–	22	–	Lambda closed-loop control, rich stop	12-12	Eng. at norm. op. temp., idle Current rise to:	——	12...16 mA
32	–	23	–	Lambda closed-loop control, lean stop	12-12	Eng. at norm. op. temp., idle Current drop to:	——	-8...-12 mA

FD = Date of manufacture

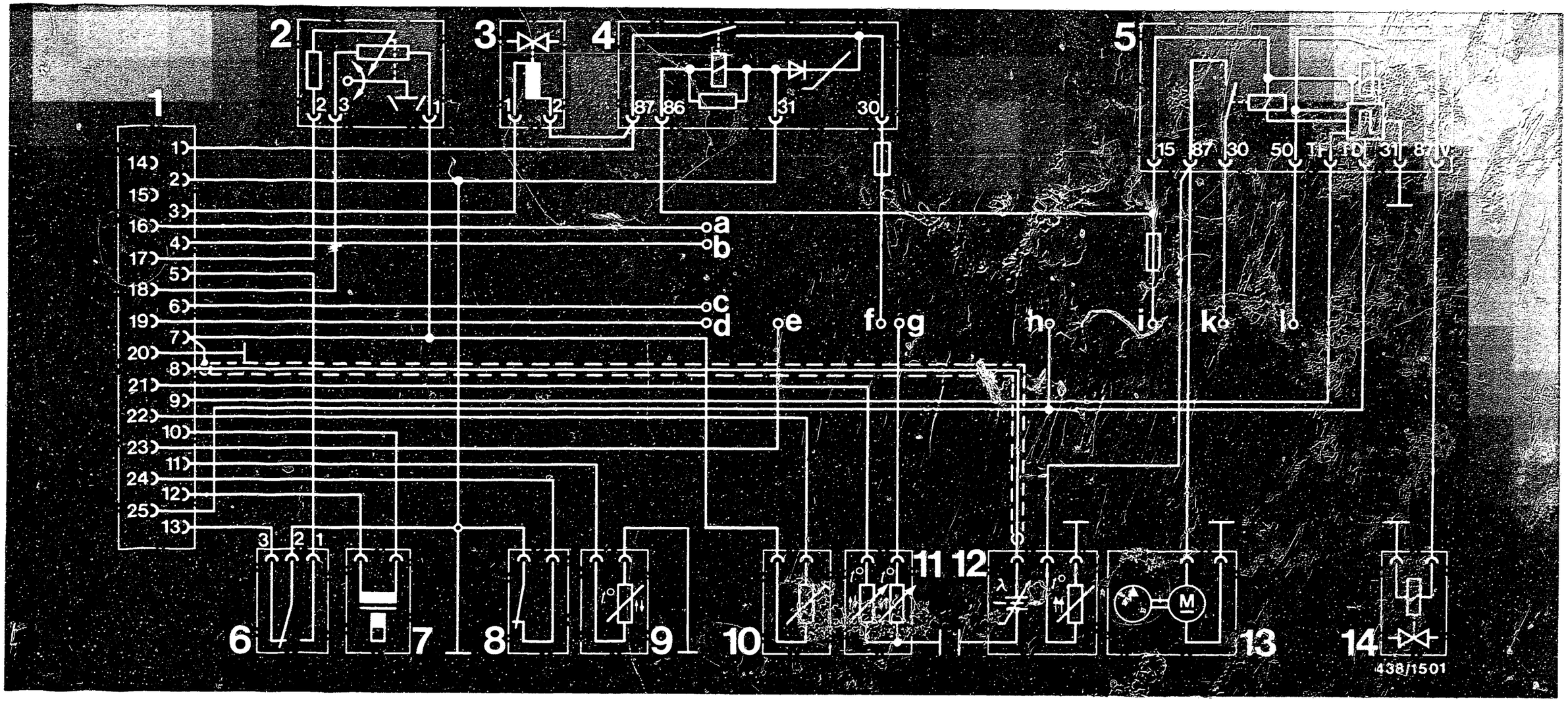


1 = Control-unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Idle actuator
4 = Over-voltage protection relay
5 = Electronic relay for electric fuel pump and cold-start valve actuation
6 = Throttle-valve switch, idle/full load
7 = Electro-hydraulic pressure actuator
8 = Throttle-valve switch, idle/linkage
9 = Temperature sensor, intake air (NTC I)
10 = Trimming plug, map adjustment
11 = Temperature sensor, engine (Double NTC)
12 = Heated lambda sensor
13 = Electric fuel pump
14 = Cold-start valve

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

K21 — ⟹

K22 — ⟺



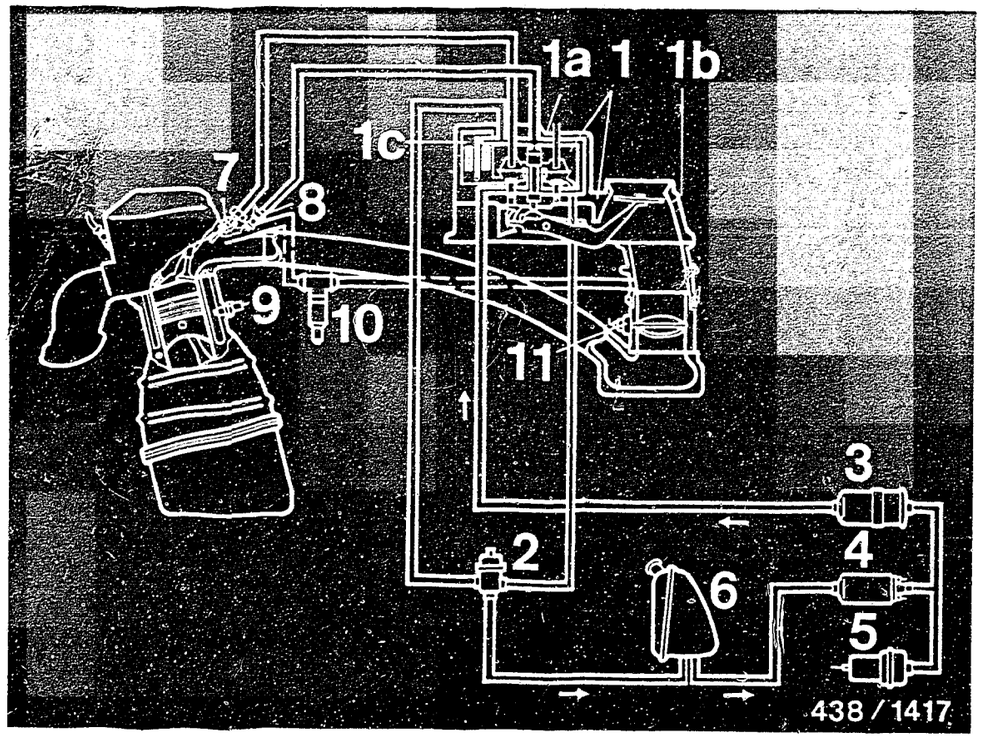
a = Transmission switch (only Automatic)
b = Consumption signal
c = Connection of Tempomat operating element
d = Connection of air-conditioner control unit
e = Lambda test output

f = Terminal 30 (B +)
g = Ignition system (EI-L)
h = TD signal, ignition
i = Terminal 15
k = Terminal 30 (B +)
l = Terminal 15a - starting motor

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT (CONTINUED)

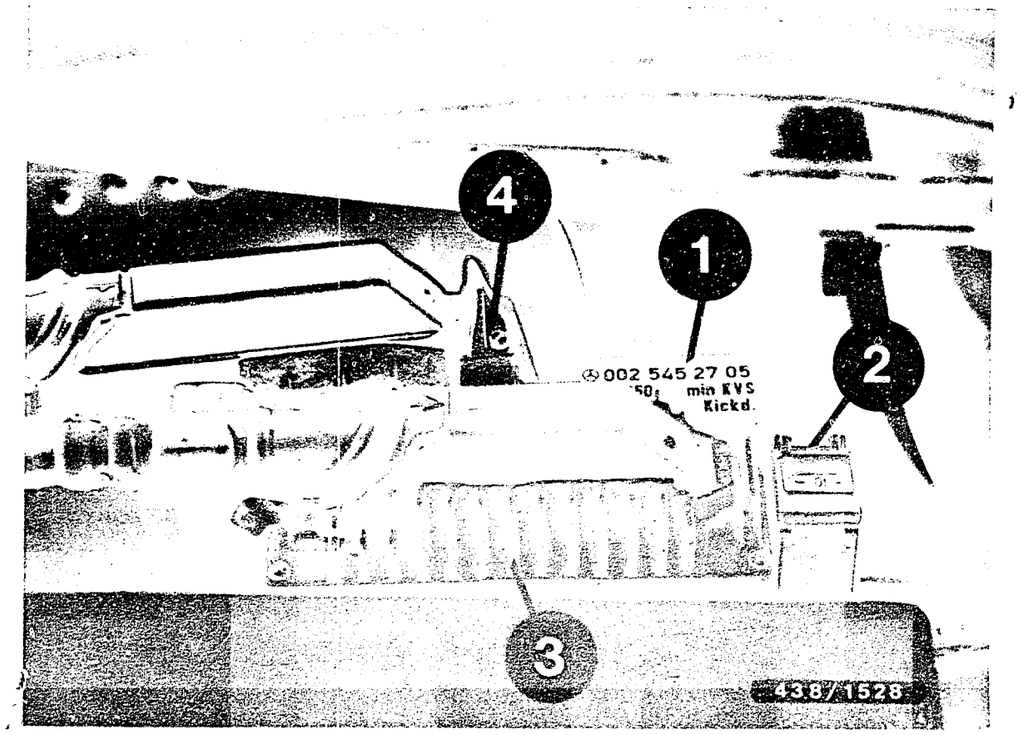
K23 —— <⟹>

K24 —— <⟸



1 = Mixture-control unit
1a = Fuel distributor
1b = Air-flow sensor
1c = Electro-hydraulic pressure actuator
2 = Pressure regulator, primary pressure
3 = Fuel filter
4 = Electric fuel pump
5 = Fuel accumulator
6 = Fuel tank
7 = Injection valve
8 = Cold-start valve
9 = Temperature sensor engine (Double NTC)
10 = Idle actuator
11 = Throttle-valve switch, idle/full load

DIAGRAM OF AIR AND FUEL LINES



1 = Electronic relay for electric-fuel-pump and cold-start valve actuation

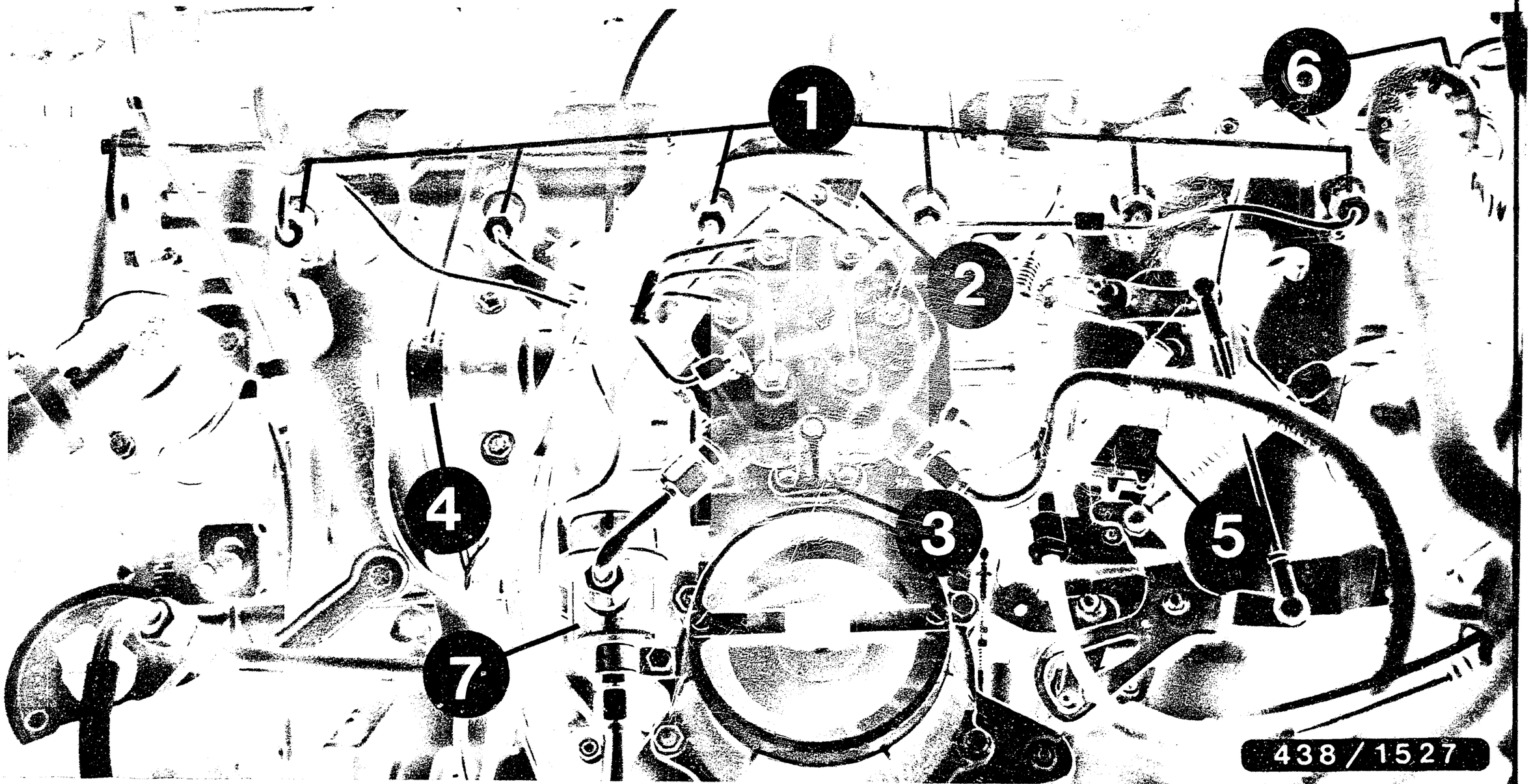
2 = Over-voltage protection relay

3 = KE-Jetronic control unit

4 = ABS controller (if present)

In Type 126, the electric fuel pump relay and the over-voltage protection relay are positioned in the engine compartment on the left.
The KE-Jetronic control unit and the mixture map trimming plug are installed in the footwell on the right behind the side panel in the Type 126.

INSTALLATION POSITION OF COMPONENTS



1 = Fuel-injection valves
2 = Start valve
3 = Mixture-control unit
4 = Idle actuator
5 = Throttle-valve switch, idle (microswitch on accelerator linkage)
6 = Engine-temperature sensor (concealed)
7 = Pressure regulator

INSTALLATION POSITION OF COMPONENTS

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5008

BOSCH system : KE 3.1 - Jetronic

Make of vehicle : Mercedes-Benz

Basic microcard : PKW-014

Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* This microcard contains the trouble-shooting instructions for the following Mercedes-Benz model valid at the time of writing:

  300 E,SE,SEL, 3,0l/6Zyl. CH/S 12.85->

* Trouble-shooting with these instructions can be done only when the data of the "After-Sales-Service Information for Vehicles" (KFZ-000) correspond to the the vehicle type and the BOSCH number of the KE-Jetronic control unit installed.

* Control unit with digital technology, characteristic-map controlled by microprocessor.

* Electronically-controlled idle-speed regulation with single-winding rotary actuator, without bypass adjusting screw.

* Activated carbon filter and regeneration valve for returning gasoline fumes into the intake manifold (Fuel evaporation control system).

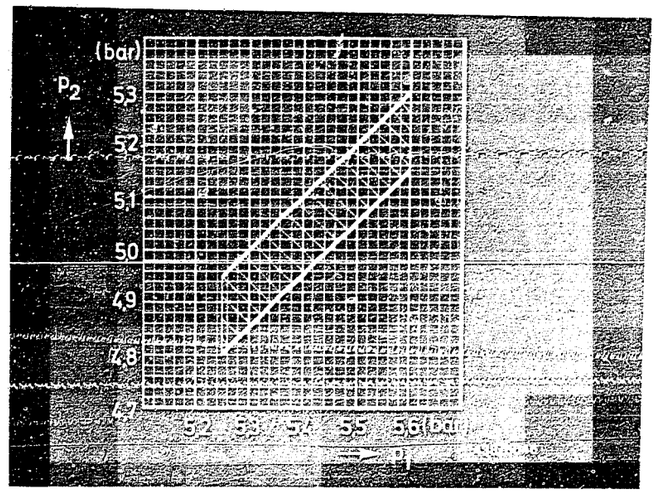
* Exhaust-gas recirculation (non-Bosch system)

Important note:

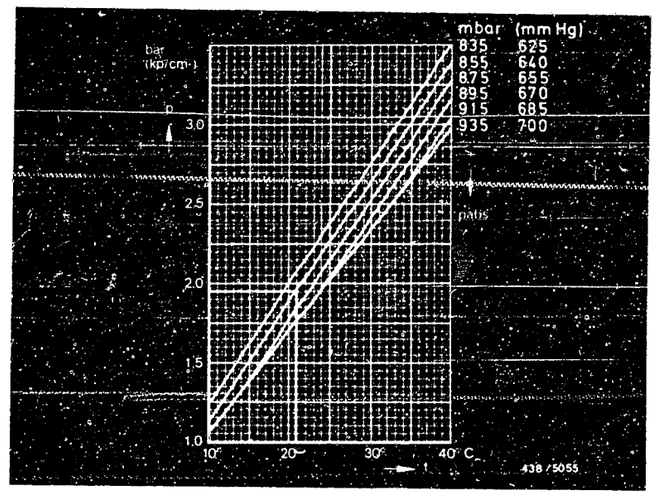
When referring to a basic microcard, note that the test specifications should always be taken from the vehicle-specific brief instructions.

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	at least 1400 cm ^{3} /min	
2	Primary pressure:	5,25...5,6 bar	
3	Differential pressure: Suppression of peak coil current: actuate starting motor with fuel-pump relay disconnected. Do <u>not</u> switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0.15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 2,7 bar 2,6 bar	
5	Injection valves, opening pressure:	3,0...4,1 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA)	Setting point: (cm ^{3} /min)	Max. permis. delivery: (cm ^{3} /min)
	Idle: Part load: Full load:	6,0 40,0 100,0	6,6 42,5 109,0
	Min. delivery at max. air-flow sensor plate defl.:	140 cm ^{3} /min	



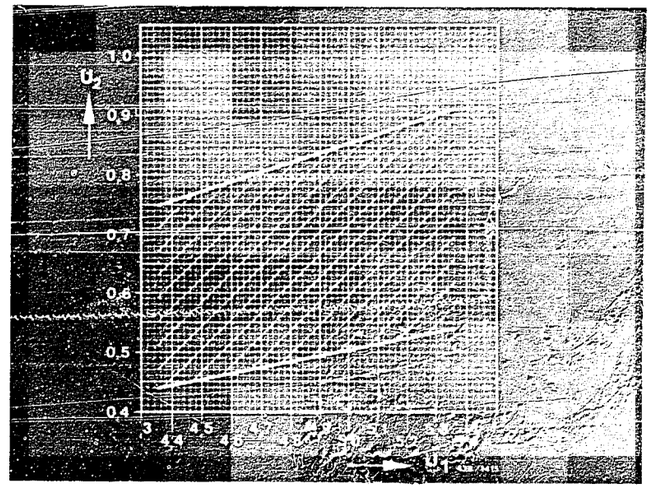
p_1 = Primary pressure
p_2 = Lower-chamber pressure



No.	Testing/requirements for testing	Test specification
7	KE-throttle flow-through quantity:	130...150 cm ^{3} /min
8	Air-temperature sensor (NTC I): Air temperature +15...+30°C:	 1,3...3,6 k Ω
9	Engine-temperature sensor (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting: Fuel-distributor support - needle bearing:	 20,5...21,6 mm
11	Idle-speed adjustment: Idle-speed regulation: Adjustment of the idle air quantity not possible. Engine must be at operating temperature for testing. Idle speed: Shift to driving position, engine speed: CO concentration in exhaust: Adjust at idle-mixture-adjusting screw. After correction, repeat measurement.	 720...820 min $^{-1}$ 600...700 min $^{-1}$ 0,3...0,9 vol.-%

TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
12	Signal, air-flow sensor potentiometer: (Checking necessary when poor idle and/or part-load behavior) Measurement using test adapter and voltmeter. Determine supply voltage of potentiometer: Set value (test adapter, V-position 10): Determine potentiometer signal at idle speed. (Test adapter, V-position 11) Set value corresponding to supply voltage: Adjust signal if necessary at trimming potentiometer (at right next to potentiometer pins). Afterwards, re-secure adjusting screw of trimming potentiometer using black sealing compound (e.g Teroson).	 4,35...5,35 V See chart



U_1 = Supply voltage potentiometer

U_2 = Potentiometer voltage signal

p1 = Primary pressure

p2 = Lower-chamber pressure

SELF-DIAGNOSIS

All Daimler-Benz 4- and 6-cylinder engines in the current series (approx. 10.85) are equipped with self-diagnosis using on-off ratio measurement.

Incorrect input signals from the KE-Jetronic control unit can be displayed with the lambda closed-loop tester at the lambda test output (diagnosis socket, socket 3).

This provides information on short and open circuits. Defects which occur sporadically (e.g. loose contacts) are not indicated. Output of fault signals has priority over output of the lambda closed-loop signal.

We will not go into the defects which can be indicated in more detail here, since the input signals of the KE-Jetronic control unit can be tested with the universal test adapter (rapid-diagnosis chart).

However, if when testing the lambda closed-loop control by means of on-off ratio measurement, a constant on-off ratio is indicated, then the input signals of the KE-Jetronic control unit should be tested (rapid diagnosis chart).

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 WITH KE3 ADAPTER LEAD 1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the the KE-Jetronic, inlcuding the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

A t t e n t i o n :

When carrying out the test, make sure that the trimming plug is in position 1.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	| V	4	–	Int. resistance(R_i) pressure actuator	12–10	Disconnect control-unit lead plug.	20...30 Ω
2	| V	5	–	Resistor NTC II (engine)	21– 2	Engine temperature +15°...+30° C: approx. +80° C :	1,3...3,6 k Ω 250...390 Ω
3	| V	6	–	Resistor NTC I (intake air)	11– 2	Air temperature in area of NTC I: +15°...+30° C:	1,3...3,6 k Ω
4				Signal, altitude sensor		Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	Test step not applicable!
5	| V	9	–	Throttle-valve switch, idle	13– 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	 0...10 Ω > 1000 Ω
6	| V	10	–	Throttle-valve switch, full load	5– 2	Throttle valve closed: fully open:	infinite Ω 0...10 Ω
7	| V	11	–	Microswitch idle linkage	24– 2	Throttle valve closed: open:	0...10 Ω infinite Ω
8	| V	12	–	Ground, control unit	20– 2		0...10 Ω
9	| V	13	–	Ground, pin 7	7– 2	Switch off ignition. Connect control unit.	0...10 Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
10	| V	14	–	Trimming plug mixture map	22– 2	Disconnect control-unit plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) to engine ground. Trimming-plug position 1: 2: 3: 4: 5: 6: 7:	 50... 60 Ω 100...120 Ω 150...190 Ω 230...270 Ω 330...370 Ω 430...470 Ω 570...620 Ω
11	| V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer. Selection lever position P,N: Driving position selected:	 0...10 Ω infinite Ω
12	5	–	–	TD signal	25– 2	Start engine (starting motor):	Voltage undefined
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	8...15 V
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	8...15 V
16	9	–	–	Air-conditioner cut-in signal	19– 2	Switch off ignition. Connect control unit. Start engine, switch on air conditioner. Temperature regulator = minimum temperature	 8...15 V
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,35 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
18	11	–	–	Signal, air-flow sensor potentiometer	17– 2	Switch on ignition. Air-flow sensor plate in neutral position: Deflect air-flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V
19	13	–	1	Temperature signal from control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage undefined Voltage change
21	–	–	–	Peak coil current	12–12	Switch on ignition:	->FD —— : ——— mA FD 550->: 9...11 mA
22	–	–	1	Warm-up enrichment +20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	->FD —— : ——— mA FD 550->: 10...14 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Engine at normal operating temperature, idle. Current value with btn 2 pressed;	->FD —— : ——— mA FD 550->: 1... 4 mA
24	–	21	1	Starting enrichment	12–12	So that engine fails to start: Disconnect speed relay for electric fuel pump. Short circuit ignition coil term. 4 to ground via resistance of at least 2k Ω . (E.g. with sleeve-type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 s.) to:	->FD —— : ——— mA FD 550->: 50...70 mA

FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

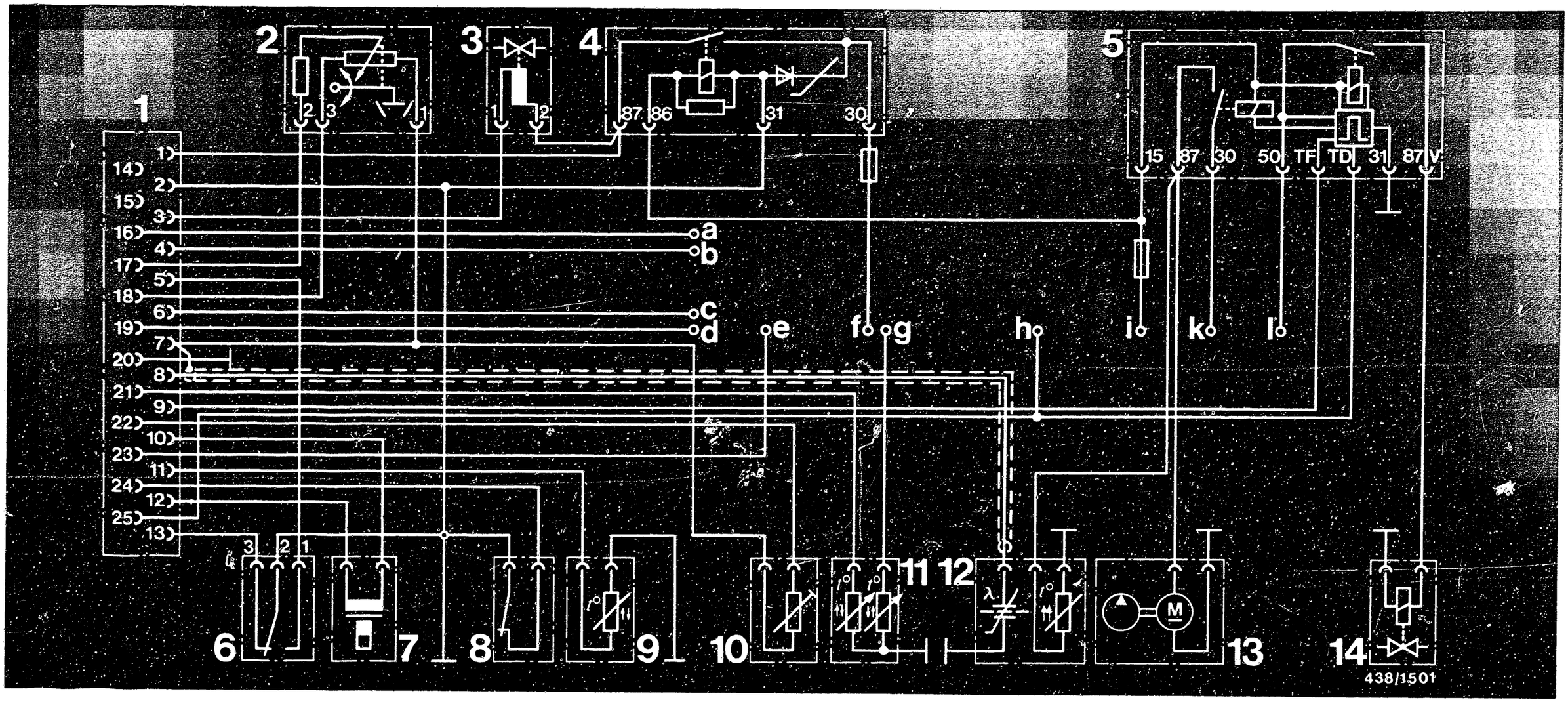
No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
25	–	21	1	Post-start enrichment	12-12	Start engine (at normal operating temperature) while actuating btn 1. Current value: Current value constant for approx: Then slow speed regulation to:	 ->FD ——: ——— mA FD —— ->: ——— mA ->FD ——: ——— s FD —— ->: ——— s ->FD ——: ——— mA FD —— ->: ——— mA
26	–	21	1	Acceleration enrichment	12-12	Engine at normal operating temperature, idle. While actuating btn 1, perform snap acceleration of engine. Thus current rise (approx. 1 s) to: Note: Level of current value dependent upon intensity of acceleration (travel/duration of air-flow sensor flap movement).	 ->FD ——: ——— mA FD 550 ->: 35...55 mA
27	–	–	–	Overrun cut-off	12-12	Re-connect ammeter (swap positive and negative) Start engine (normal operating temperature). Speed n to approx.: Hold there. Manually actuate idle throttle-valve switch (for 4- and 6-cyl. engines, microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:	 ->FD ——: ——— min^{-1} FD 550 ->: 3000 min^{-1} -40...-80 mA

*) FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01

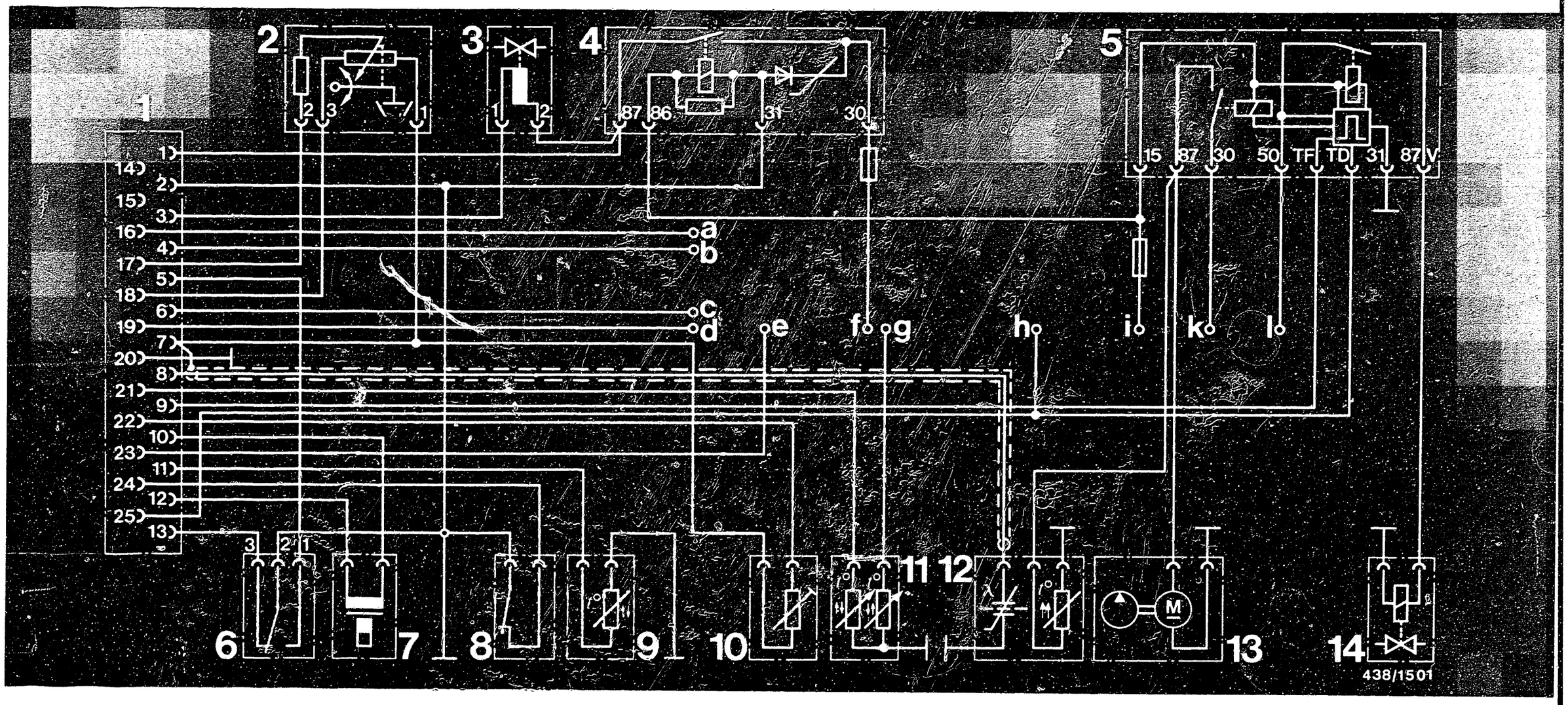
No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specification
28	–	24	–	Full-load enrichment	12-12	Engine at normal operating temperature, idle. Current value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: A t t e n t i o n: Do this very briefly, so that speed does not rise too much and engine is not damaged.	 ->FD —— : ——— mA FD 550->: 1... 4 mA ->FD —— : ——— mA FD 550->: 6...10 mA

*) FD = Date of manufacture



1 = Control-unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Idle actuator
4 = Over-voltage protection relay
5 = Electronic relay for electric fuel pump and cold-start valve actuation
6 = Throttle-valve switch, idle/full load
7 = Electro-hydraulic pressure actuator
8 = Throttle-valve switch, idle/linkage
9 = Temperature sensor, intake air (NTC I)
10 = Trimming plug, map adjustment
11 = Temperature sensor, engine (Double NTC)
12 = Heated lambda sensor
13 = Electric fuel pump
14 = Cold-start valve

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT



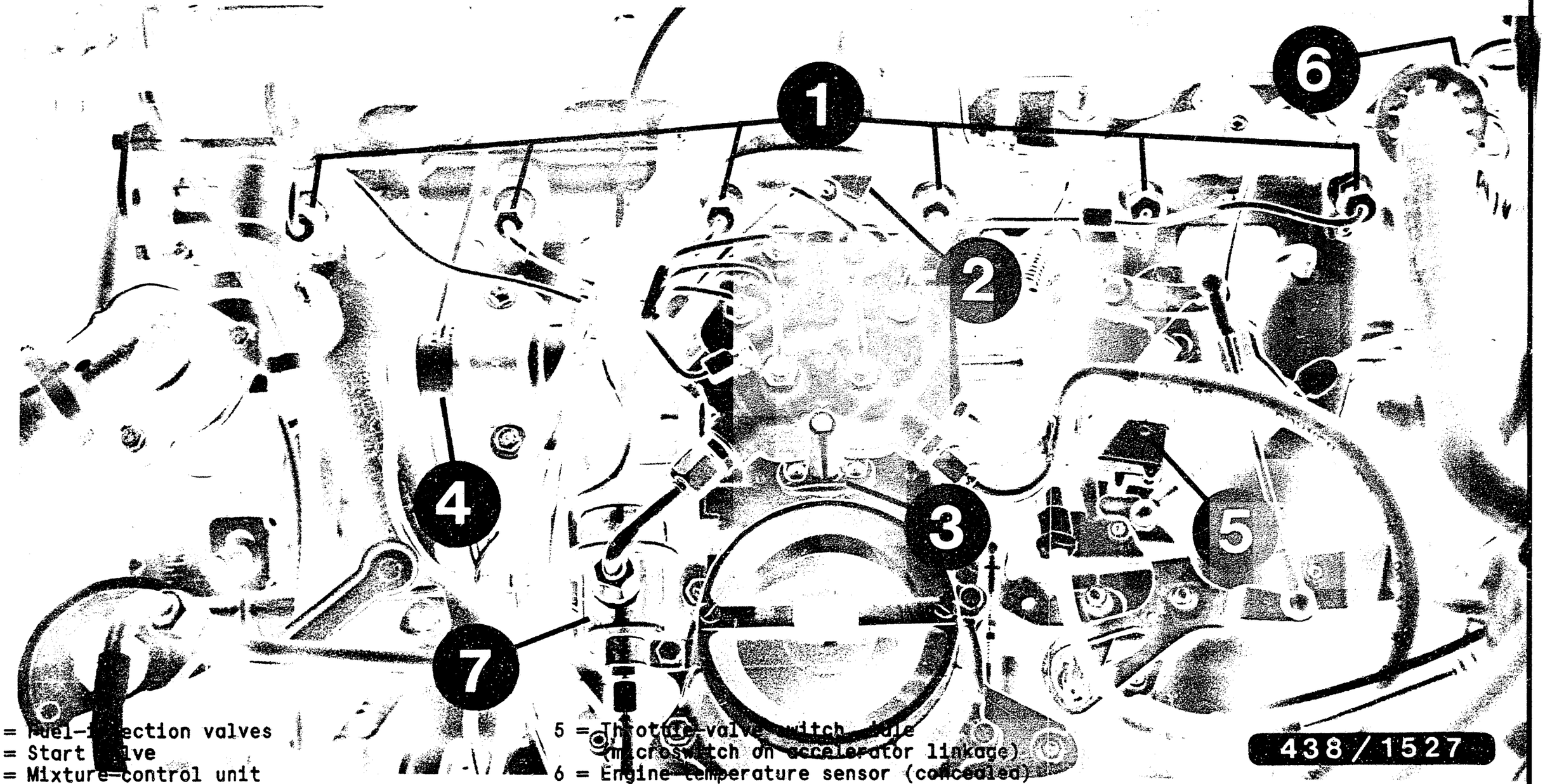
a = Transmission switch (only Automatic)
b = Consumption signal
c = Connection of Tempomat operating element
d = Connection of air-conditioner control unit
e = Lambda test output

f = Terminal 30 (B +)
g = Ignition system (EI-L)
h = TD signal, ignition
i = Terminal 15
k = Terminal 30 (B +)
l = Terminal 15a - starting motor

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT (CONTINUED)

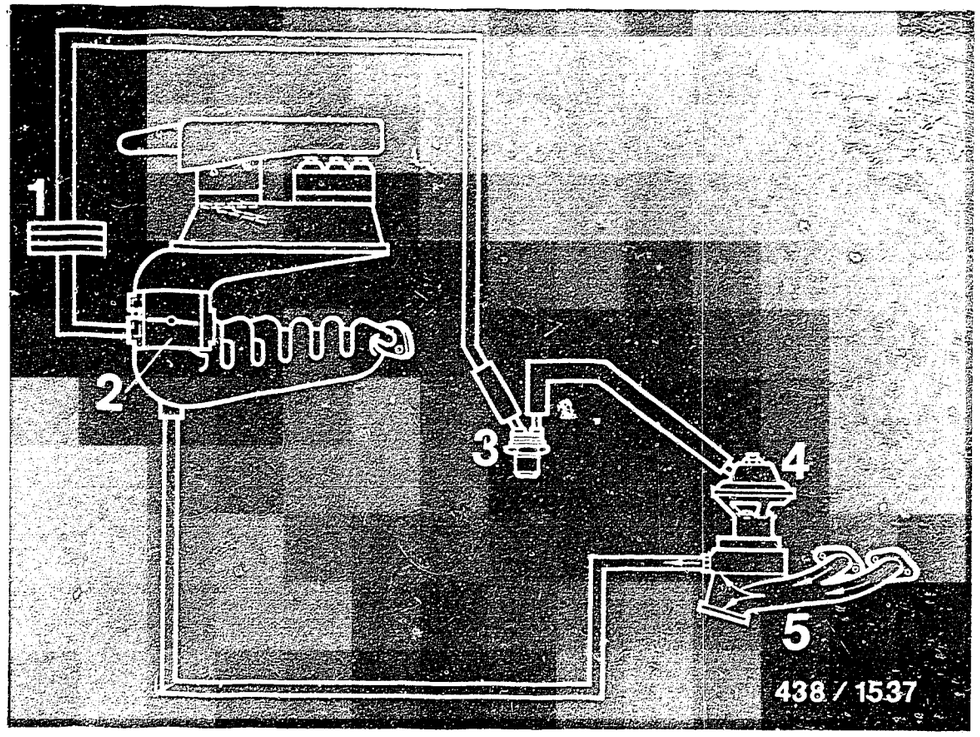
L23 —⟺

L24 —⟸



1 = Fuel-injection valves
2 = Start valve
3 = Mixture-control unit
4 = Idle actuator
5 = Throttle-valve switch (idle (microswitch on accelerator linkage)
6 = Engine temperature sensor (concealed)
7 = Pressure regulator

INSTALLATION POSITION OF COMPONENTS



1 = Throttle valve
2 = Throttle-valve assembly
3 = Thermo-valve
4 = Exhaust-gas recirculation valve
5 = Exhaust manifold

IMPORTANT GENERAL INFORMATION

Exhaust-gas recirculation

Exhaust-gas recirculation (continued)

In exhaust-gas recirculation, under certain engine operating conditions some of the exhaust gases are returned to the intake tract, to take part in combustion again. This results in a reduction of peak combustion temperatures, thus reducing emissions of oxides of nitrogen (NO_x). Depending on the engine's operating condition, the amount of exhaust gas recirculated is varied, or is cut off entirely.

Exhaust-gas recirculation takes place:

* Above an engine temperature of +40°C
* In the middle and upper part-load range
* Within the part-load range, the amount of exhaust gas is determined depending on intake-manifold vacuum and the throttle-valve position.

Testing exhaust-gas recirculation:

Engine at operating temperature. Slowly increase engine speed. The exhaust-gas recirculation valve should open.

Testing the exhaust-gas recirculation valve: Connect a vacuum tester (e.g. Mityvac pump) and generate vacuum. Opening should start at about 100 mbar, with the valve fully open starting at approx. 200 mbar.

Checking the thermo-valve: Check flow-through and sealing. Vacuum inlet at the slanted fitting.

Checking throttle valve: Check flow-through and sealing. Vacuum inlet at white fitting.

Important information: Disconnect the vacuum hose from the exhaust-gas recirculation valve and seal off before idle-speed adjustment.

T A B L E O F C O N T E N T S

Trouble-shooting instructions : MB-5011

BOSCH system : KE 3.1-Jetronic

Make of vehicle : MERCEDES-BENZ

Basic microcard : PKW-014

Tests without coordinate details are not applicable in these trouble-shooting instructions.

SPECIAL FEATURES

* This microcard contains the trouble-shooting instructions, valid at the time of publication, for the following Mercedes-Benz model:

  420 SE/SEL/SEC/SL, 4,21/8Zyl. CH/S 12.85->

* Trouble-shooting with these instructions may only then take place when the details of the "Summary - Service Information for Vehicles" (KFZ-000) coincide with those of the vehicle type and with the BOSCH number of KE-Jetronic control unit installed.

* Control unit using digital techniques, characteristic-map control using microprocessor.

* Electronically controlled low-idle-speed control with single-winding rotary actuator, without bypass adjusting screw.

* Activated-carbon filter and regeneration valve for return of gasoline vapors into the intake manifold. (Fuel evaporation system)

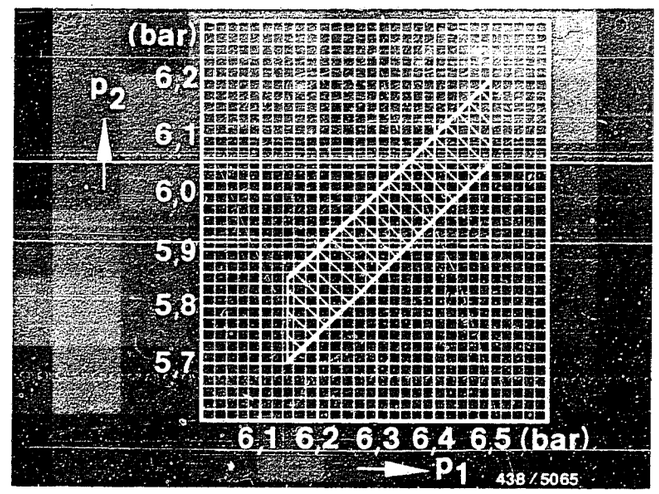
* Secondary-air injection

Important note:

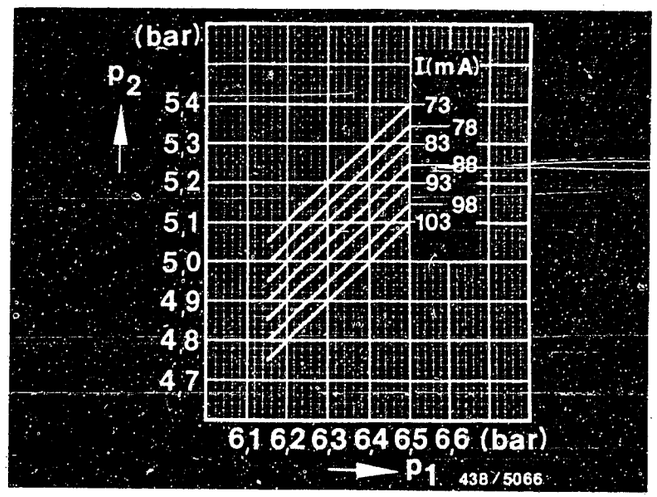
If reference is made to a basic microcard, always make certain you use the test specifications from the vehicle-specific brief instructions.

TEST SPECIFICATIONS

No.	Testing/Test condition	Test specification	
1	Electric fuel pump – fuel delivery:	at least 1650 cm ^{3} /min	
2	Primary pressure:	6,15...6,5 bar	
3	Differential pressure: Suppression of peak coil current: actuate starting motor with fuel-pump relay disconnected. Do <u>not</u> switch off ignition after starting. Take lower-chamber pressure set value "warm" from top chart corresponding to primary pressure measured. (Actuator current 0 mA) Take lower-chamber pressure set value "cold" from bottom chart corresponding to primary pressure measured and actuator current. Tolerance ± 0.15 bar. Simulation of "cold" state: press push-button 3 at test adapter.		
4	Leakage test, complete system: Minimum pressure after 10 mins: Minimum pressure after 20 mins:	 3,3 bar 3,2 bar	
5	Injection valves, opening pressure:	3,7...4,8 bar	
6	Fuel deliveries, comparative measurement: (Actuator current 0 mA)	Setting point: (cm ^{3} /min)	Max. permis. delivery: (cm ^{3} /min)
	Idle: Part load: Full load:	6,0 40,0 100,0	6,8 42,5 109,0
	Min. delivery at max. air-flow sensor plate defl.:	140,0 cm ^{3} /min	



p_1 = Primary pressure
p_2 = Lower-chamber pressure



TEST SPECIFICATIONS (CONTINUED)

No.	Testing/Test condition	Test specification
7	Rate of flow, KE restriction:	130...150 cm^3 /min
8	Temperature sensor, air (NTC I): Air temperature +15...+30°C:	 1,3...3,6 k Ω
9	Temperature sensor, engine (NTC II): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	 1,3...3,6 k Ω 250...390 Ω
10	Idle-mixture-adjusting screw basic setting: Fuel-distributor seat - needle bearing:	 22,6...22,8 mm
11	Idle adjustment: Low-idle-speed control (non-Bosch product). For testing, engine at norm. op. temperature Idle speed: Idle-actuator current at idle speed: Engage driving position, speed: Check lambda closed-loop control: Measurement with lambda closed-loop control tester (e.g. KDJE-P 600) and adapter lead (e.g. KDJE-P 600/52) at diagnosis socket outlet (pin 3). Alternatively: Current measurement using universal test adapter. Put fuel evaporation system out of operation. Determine on/off ratio (mean value) at n = 2500 min^{-1} . Deviation of on/off ratio (mean value) at idle compared to n = 2500 min^{-1} : Adjustment at idle-mixture-adjusting screw. After adjustment, repeat measurement.	 600...700 min^{-1} 700...1000 mA 450...550 min^{-1} +5...+15 %

SELF-DIAGNOSIS

All Daimler-Benz 8-cylinder engines have been equipped as of FD 552 with self-diagnosis using on-off ratio measurement.

Defective input signals of the KE-Jetronic control unit may be indicated at the lambda test output (diagnosis socket outlet, socket 3) using the lambda closed-loop control tester.

Short circuiting and breaks in lines are detected. Sporadically occurring faults (e.g. loose contact) are not detected. Output of the fault signals takes priority over output of the lambda closed-loop control signal.

The faults which can be indicated are not discussed in detail here, since the input signals of the KE-Jetronic control unit may be tested using the universal test adapter (rapid diagnosis chart).

However, should a constant on-off ratio be indicated when testing the lambda closed-loop control using on-off ratio measurement, the input signals of the KE-Jetronic control unit must be checked (rapid diagnosis chart).

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 WITH KE3 ADAPTER LEAD 1 684 463 169 AND APPROPRIATE MULTITESTER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic expert to quickly check the electric/electronic peripheral and control-unit functions of the the KE-Jetronic, inlcuding the lambda closed-loop control.

Important note on the rapid diagnosis chart:

The "Test conditions" column gives information as to in which test steps the control-unit plug must be connected/disconnected. Make absolutely certain that there is no current at the system when connecting or disconnecting, i.e. the ignition must be switched off and the electric safety circuit must not be short circuited.

The "Test connections" column provides information about the leads connected to the respective measuring path, referring to the assignment in the control-unit plug. Possibly necessary trouble-shooting is with regard to these leads.

A t t e n t i o n :

When carrying out the test, make sure that the trimming plug is in position 1.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
1	V	4	-	Int. resistance(R_i) pressure actuator	12-10	Disconnect control-unit lead plug.	20...30 Ω
2	V	5	-	Resistor NTC II (engine)	21- 2	Engine temperature +15°...+30° C: approx. +80° C :	1,3...3,6 k Ω 250...390 Ω
3	V	6	-	Resistor NTC I (intake air)	11- 2	Air temperature in area of NTC I: +15°...+30° C:	1,3...3,6 k Ω
4				Signal, altitude sensor		Connect control unit. Switch on ignition. Voltmeter connection to blue Ω sockets. Signal altitude-dependent: 0 meters (sea level): 500 meters: 1000 meters: 1500 meters: 2000 meters: 3000 meters:	Test step not applicable!
5	V	9	-	Throttle-valve switch, idle	13- 2	Switch off ignition. Disconnect control-unit lead plug. Throttle valve closed: open:	0...10 Ω > 1000 Ω
6	V	10	-	Throttle-valve switch, full load	5- 2	Throttle valve closed: fully open:	infinite Ω 0...10 Ω
7	V	11	-	Microswitch idle linkage	24- 2	Throttle valve closed: open:	——— Ω infinite Ω
8	V	12	-	Ground, control unit	20- 2		0...10 Ω
9	V	13	-	Ground, pin 7	7- 2	Switch off ignition. Connect control unit.	0...10 Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
10	| V	14	–	Trimming plug mixture map	22– 2	Disconnect control-unit plug. Disconnect lead plug from air-flow sensor potentiometer and connect socket 1 of plug (in upper installation position) to engine ground. Trimming-plug position 1: 2: 3: 4: 5: 6: 7:	 900... 1020 Ω 1200... 1350 Ω 1500... 1750 Ω 2000... 2400 Ω 3000... 3600 Ω 5000... 5600 Ω 11000...12000 Ω
11	| V	15	–	Transmission switch (only automatic transmission)	16– 2	Connect air-flow sensor potentiometer. Selection lever position P,N: Driving position selected:	 0...10 Ω infinite Ω
12	5	–	–	TD signal	25– 2	Start engine (starting motor):	Voltage undefined
13	6	–	–	Control-unit supply	1– 2	Switch on ignition:	8...15 V
14	7	–	–	Idle actuator supply and continuity	3– 2	Switch on ignition:	——— V
15	8	–	–	Tempomat signal	6– 2	Switch Tempomat operation:	——— V
16	9	–	–	Air-conditioner cut-in signal	19– 2	Switch off ignition. Connect control unit. Start engine, switch on air conditioner. Temperature regulator = minimum temperature	 ——— V
17	10	–	–	Supply, air-flow sensor potentiometer	18– 2	Switch on ignition:	4,35...5,35 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
18	11	–	–	Signal, air–flow sensor potentiometer	17– 2	Switch on ignition. Air–flow sensor plate in neutral position: Defect air–flow sensor plate by hand, continuous voltage rise up to max.:	0 V 5,35 V
19	13	–	1	Temperature signal form control unit	9– 2	Switch on ignition. While actuating btn 1:	1,5...1,9 V
20	14	–	–	Consumption signal	4– 2	Start engine – idle: With regulation:	Voltage indefined Voltage change
21	–	–	–	Peak coil current	12–12	Switch on ignition:	–>FD ——: ——— mA FD 549 –>: 65...85 mA
22	–	–	1	Warm–up enrichment + 20°C	12–12	Warm up engine – idle. Current value with btn 1 pressed:	–>FD ——: ——— mA FD 549 –>: 14...20 mA
23	–	24	2	Actuator current Engine at norm. op. temp.	12–12	Engine at norm. op. temp., idle. Current value with btn 2 pressed; reading oscillating, mean value:	–>FD ——: ——— mA FD 549 –>: –1...+1 mA
24	–	21	1	Starting enrichment	12–12	So that engine fails to start: Disconnect speed relay for electric fuel pump. Short circuit ignition coil term. 4 to ground via resistance of at least 2 k Ω . (e.g. with sleeve–type suppressor and spark gap) While btn 1 pressed, actuate starting motor. Current rise (max. 1 sec.) to:	–>FD ——: ——— mA FD 549 –>: 120...140 mA

*) FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

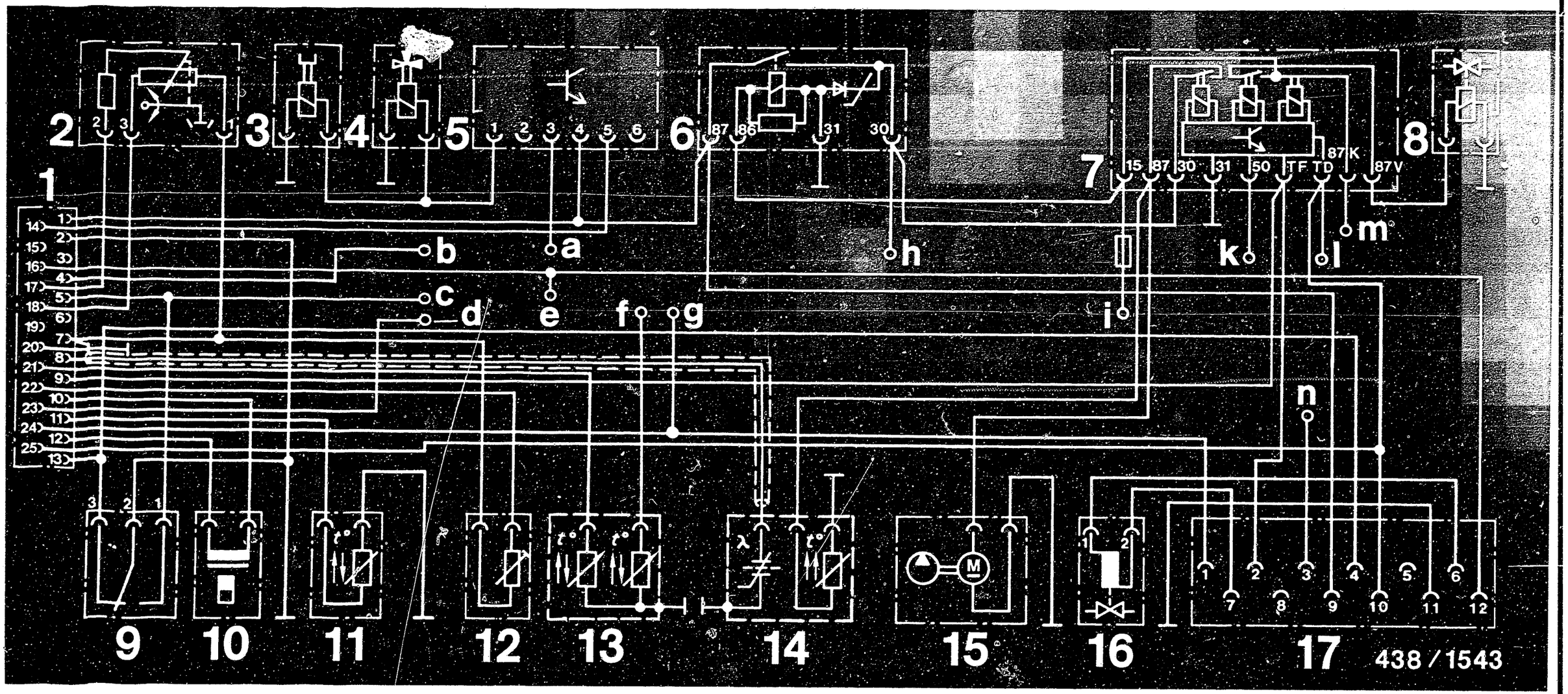
No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specifications
25	—	21	1	Post-start enrichment	12-12	Start engine (at normal operating temperature) while actuating btn 1. Current value: Current value constant for approx: Then slow speed regulation to:	 ->FD ——: ——— mA FD 549 ->: 65...85 mA ->FD ——: ——— s FD 549 ->: 7...13 s ->FD ——: ——— mA FD 549 ->: 14...20 mA
26	–	21	1	Acceleration enrichment	12-12	Engine at normal operating temperature, idle. While actuating btn 1, perform snap acceleration of engine. Thus current rise (approx. 1 s) to: Note: Level of current value dependent upon intensity of acceleration (travel/duration of air-flow sensor flap movement).	 ->FD ——: ——— mA FD 549 ->: 50...70 mA
27	–	–	–	Overrun cut-off	12-12	Re-connect ammeter (swap positive and negative) Start engine (normal operating temperature). Speed n to approx.: Hold there. Manually actuate idle throttle-valve switch (for 4- and 6-cyl. engines, microswitch at accelerator linkage). Engine hunts. Current reading during falling speed phase:	 ->FD ——: ——— min^{-1} FD 549 ->: 1700 min^{-1} -40...-80 mA

*) FD = Date of manufacture

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/Btn V	Ω	Btn	Under test	Test pins	Test conditions	Test specification CAT
28	–	24	–	Full-load enrichment	12-12	Engine at normal operating temperature, idle. Reading oscillating, mean value: Briefly push accelerator pedal to floor (full-load throttle-valve switch must switch). During speed rise, current value rises by: A t t e n t i o n: Do this very briefly, so that speed does not rise too much and engine is not damaged.	 ->FD ——: ——— mA FD 549 ->: -1...+1 mA ->FD ——: ——— mA FD 549 ->: 3... 6 mA
29	–	21	–	Lambda closed-loop control, open-loop control mode	12-12	Disconnect regeneration lead to throttle-valve assembly at generation valve and seal. Engine at norm. op. temp., idle. Current value:	 – 1...+ 1 mA
30	–	24	–	Lambda closed-loop control, closed-loop control mode	12-12	Engine at norm. op. temp., idle. Closed-loop control mode can be recognized from the oscillating current reading. Mean value: If mean value outside tolerance, set (idle-mixture-adjusting screw) to approx.:	 – 1...+ 1 mA 0 mA
31	–	22	–	Lambda closed-loop control, rich stop	12-12	Engine at norm. op. temp., idle. Current rise to:	10... 14 mA
32	–	23	–	Lambda closed-loop control, lean stop	12-12	Engine at norm. op. temp., idle. Current drop to:	–10...–14 mA

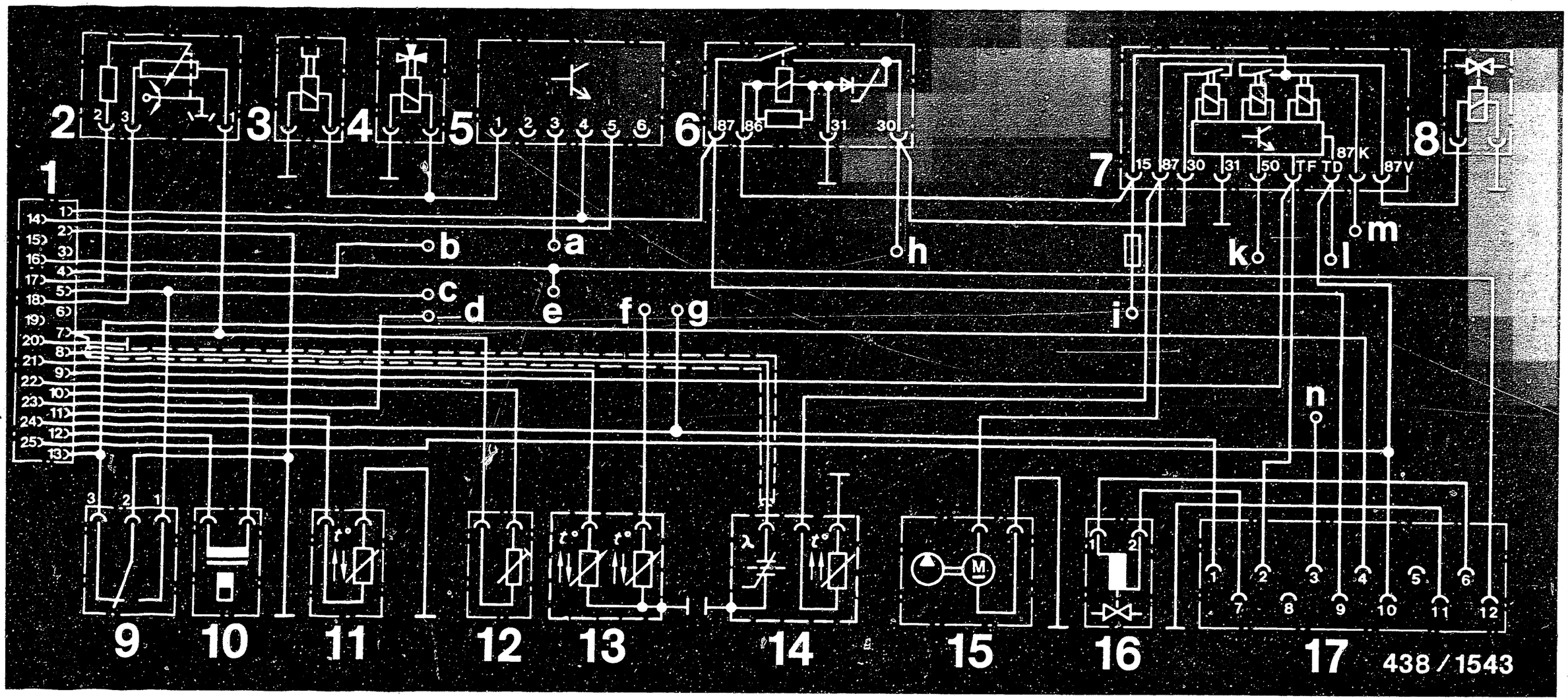
*) FD = Date of manufacture



1 = Control unit, KE-Jetronic
2 = Air-flow sensor potentiometer
3 = Electro-magnetic coupling, air pump (only CAT)
4 = Change-over valve, air pump (only CAT)
5 = Relay, air injection (only CAT)
6 = Over-voltage protection relay
7 = Electronic relay
8 = Cold-start valve
9 = Throttle-valve switch, idle/full load
10 = Electro-hydraulic pressure actuator
11 = Temperature sensor (intake air)
12 = Trimming plug, mixture map
13 = Temperature sensor, coolant (Double NTC)
14 = Heated lambda sensor
15 = Electric fuel pump
(2 pumps are installed, connected in parallel)
16 = Idle actuator (non-Bosch product)
17 = Control unit, low-idle-speed control
(non-Bosch product)

ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

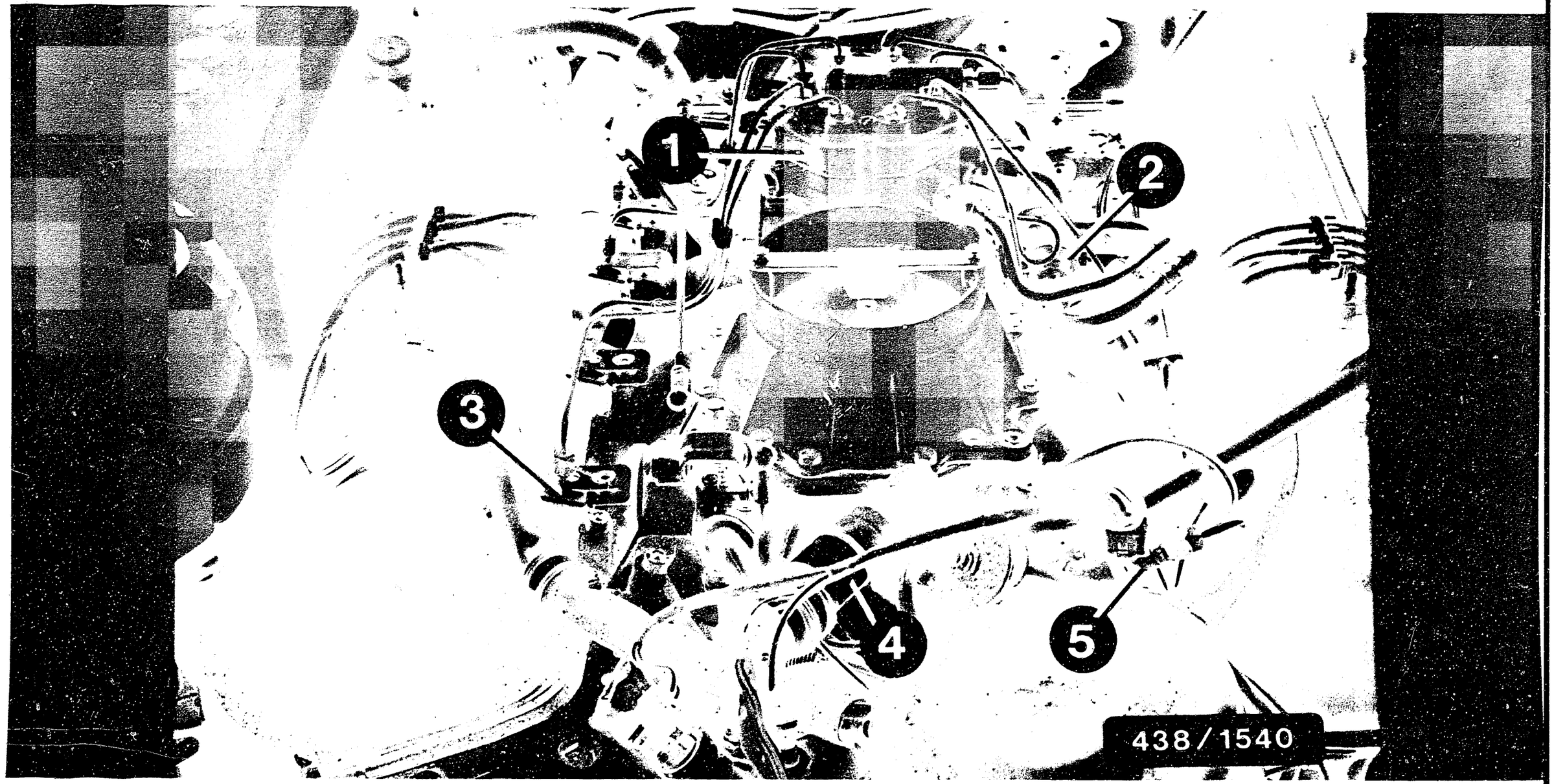
M19 ⟹
M20 ⟸⟹



a = Terminal 15
b = Plug connection, trip computer
c = Trigger box, ignition system
d = Lambda test output (diagnosis socket outlet, socket 3)
e = Plug connection, start-locking switch, socket 3
f = Trigger box, ignition system
g = Speed signal

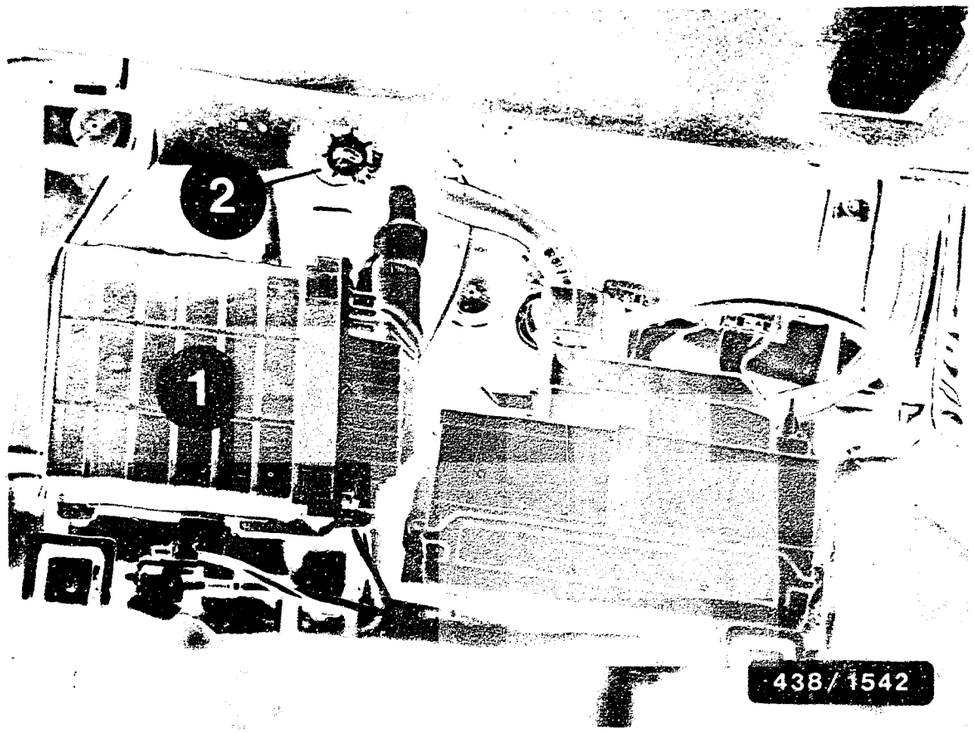
h = Terminal 30
i = Terminal 15 (fuse 7)
k = Plug connection, start-locking switch, socket 4
l = Terminal TD, ignition
m = Kick-down switch, socket 1
n = Control unit, compressor cutoff

Electrical terminal diagram with electric fuel pump safety circuit (continued)



1 = Mixture–control unit
2 = Pressure regulator
3 = Injection valve
4 = Idle actuator (non–Bosch product)
5 = Cold–start valve

INSTALLATION POSITION OF COMPONENTS



1 = KE-Jetronic control unit (Type 107)
2 = Mixture-map trimming plug

In the Type 107, the KE-Jetronic control unit and mixture-map trimming plug are positioned in the footwell on the right beneath the floor panel;
in the Type 126, in the footwell on the right behind the side panel.

Installation position of further components

Relay, electric fuel pump:
In the Type 126, in the eng. comp, on left
in the Type 107, behind the glove comp.

Relay, over-voltage protection:
In the Type 126, in the eng. comp. on left
in the Type 107, in the footwell on right behind the side panel.

Temperature sensor, engine (NTC II):
At the left (referring to forward direction of travel) at cyl. head at rear.